

State of Vermont - Agency of Natural Resources  
Department of Forests, Parks and Recreation  
and the Fish and Wildlife Department



# *Camel's Hump Management Unit*

Camel's Hump State Park, Camel's Hump State Forest and  
Huntington Gap and Robbins Mountain Wildlife Management Areas

## **Long Range Management Plan**

*7th DRAFT – October 2017*



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# Mission Statements

## ***Vermont Agency of Natural Resources***

The mission of the Agency of Natural Resources is “to protect, sustain, and enhance Vermont’s natural resources, for the benefit of this and future generations.”

Four agency goals address the following:

- To promote the sustainable use of Vermont’s natural resources;
- To protect and improve the health of Vermont’s people and ecosystems;
- To promote sustainable outdoor recreation; and
- To operate efficiently and effectively to fulfill our mission.

## ***Vermont Department of Forests, Parks and Recreation***

The mission of the Department of Forests, Parks and Recreation is to practice and encourage high quality stewardship of Vermont’s environment by monitoring and maintaining the health, integrity and diversity of important species, natural communities, and ecological processes; managing forests for sustainable use; providing and promoting opportunities for compatible outdoor recreation; and furnishing related information, education, and service.

## ***Vermont Fish and Wildlife Department***

The mission of the Vermont Fish & Wildlife Department is the conservation of all species of fish, wildlife, and plants and their habitats for the people of Vermont. To accomplish this mission, the integrity, diversity, and vitality of their natural systems must be protected.

## ***Vermont Department of Environmental Conservation***

The mission of the Department of Environmental Conservation is to preserve, enhance, restore, and conserve Vermont’s natural resources, and protect human health, for the benefit of this and future generations.

# EXECUTIVE SUMMARY

The Camel's Hump Management Unit (CHMU) is comprised of over 40 square miles of state land. This land unit is located in north-central Vermont in the towns of Duxbury, Huntington, Bolton, Fayston, Buel's Gore, Waitsfield, Richmond, and Starksboro. The CHMU is made up of 26,275 acres, consisting of Camel's Hump State Park, Camel's Hump State Forest, and Huntington Gap and Robbins Mountain Wildlife Management Areas<sup>1</sup>.

Within the CHMU there are in total, or in part, eleven named, and several un-named mountain peaks. Camel's Hump is the most prominent, at 4,083 feet elevation. There are five other mountains over 3,000 feet elevation and several over 2,000 feet elevation. The lowest point within the CHMU is along the Winooski River on the northern side of the management unit at about 300 feet elevation.

Previous long-range plans for lands within the CHMU were adopted individually by major parcel, between 1991 and 2002. Combining these parcels into one unit plan makes sense for efficiency and a more holistic approach on a larger landscape basis.

## **Historic and Scenic Values**

The lands within the CHMU have a rich and diverse history. These lands have been very significant culturally for many generations and parts of the unit were home to early European settlers, evidenced by stone foundations and walls scattered through the forest. Sites of Native American settlement are more difficult to find and decipher, but still present. Camel's Hump in particular is iconic to many Vermonters. Careful consideration will be given to all activities on the CHMU to ensure historic, cultural, and scenic values are protected.

## **Natural Communities**

A natural community is an assemblage of biological organisms, their physical environment, and the interactions between them. Twenty-six different natural communities were identified on the CHMU including fourteen uncommon types and two very rare types in Vermont. Seventeen of these natural communities are of exceptional ecological quality, and are of statewide significance. Upper elevations of the CHMU are home to conifer-dominated forests, with hardwood-dominated communities at the middle and lower elevations. Within the upland forest communities, smaller patch communities are present including seeps, wetlands, rock outcrops, and cliffs.

## **Rare, Threatened and Endangered Species**

Twenty-six rare or uncommon plant species and three animal species of concern are found on the CHMU. Six of the plant species are state listed as threatened or endangered and legally protected.

## **Wildlife, Fisheries and Habitats**

The CHMU comprises a portion of one of the largest habitat blocks in the state and thereby supports a diverse range of habitats for many wildlife species. In addition to the extensive matrix forest community, there are a number of special wildlife habitat features including wetlands, cliffs, forest openings, and soft and hard mast stands. Nearly 100 miles of high quality streams provide for healthy populations of fish. Managing for habitat diversity and healthy ecosystems encourages robust populations of large and

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<sup>1</sup> Actual acreage of CHMU exceeds 26,275 acres. This plan does not include assessments or management strategies for the Dowsville Headwaters property. This 2085 acre property was acquired in 2016 and will be incorporated into the LRMP at a later date through the addition of a plan amendment. As such, the Dowsville Headwaters property does not appear as ANR land on maps in this document.

small mammals, birds, reptiles, amphibians, and insects. For many people seeing wildlife in this natural setting adds greatly to their visitation experience.

### **Forest Products**

More than eight thousand acres of the CHMU are managed to furnish high quality forest products. Some of the best hardwood timber found in Vermont is harvested here on a sustainable basis. A wide range of benefits are provided from careful and thoughtful forest management including improved wildlife habitats, a healthier and more resilient forest, and economic stimulus. In the next fifteen years, thirty-four timber harvests are scheduled, totaling approximately 3800 acres.

### **Non-Native Invasive Species**

Of increasing concern to land managers is the influx of non-native invasive plants and insects. There are several known invasive plant infestations on the CHMU and control and possible eradication of these plant species is an important part of managing for healthy forests. Several invasive insect pests have already impacted forest health on the CHMU as well as the rest of the Vermont landscape. Several more invasive insect species are known to occur near Vermont's border. Ongoing efforts to survey for invasive species are critical.

### **Recreation**

The CHMU is a very popular recreation destination for hiking, hunting, cross-country skiing, mountain biking, and many other pursuits. There are nearly 70 miles of trails on the CHMU, with over a dozen parking area access points. Many thousands of people visit every year and experiences range from busy trails and a crowded summit, to solitary experiences in vast woods. The LRMP identifies several opportunities to improve the recreation experience and expand recreation opportunities on state land by re-routing trails, and with the appropriate partnerships, adding new trails and managing backcountry skiing glades.

### **Management Goals**

Broadly speaking, the management goals of the CHMU include protecting natural and cultural resources, providing diverse recreational opportunities, sustainable management for production of forest products, and providing high-quality wildlife habitat for target and general wildlife species. The degree to which one goal is prioritized over another is dependent on parcel ownership, existing features, legal restrictions, as well as other factors. Site-specific management decisions are guided by the Land Management Classification system.

### **Land Management Classification**

After completion of inventories and assessments, the lands, resources, and facilities held by the Vermont Agency of Natural Resources are evaluated and assigned to appropriate Agency Land Management Classification categories based upon knowledge and understanding of the resources and appropriate levels of management. The four categories as applied to the CHMU are Highly Sensitive (29%), Special Management (40%), General Management (31%), Intensive Management (<1%). This enables land managers to allocate use and management by area minimizing conflicts between competing objectives and facilitating a common understanding of the overall use or type of management to occur in particular areas of the Camel's Hump Management Unit.

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# I. PARCEL DESCRIPTION

## A. Purposes of State Land Ownership

The Agency of Natural Resources and its Department of Forests, Parks and Recreation, and Fish and Wildlife Department have been legislatively authorized to acquire lands, hold interests in lands, and conduct land management activities for the public benefit, and to manage those lands for a variety of public purposes, ranging from the protection of important natural resources to public uses of the land in appropriate places.

Natural resources include, but are not limited to biodiversity, wildlife habitat, natural communities, water bodies, wetlands, undeveloped land, scenery, and aesthetic values.

Public uses include, but are not limited to recreation, access to state lands or waters, environment related businesses, education, research, and sustainable use of renewable resources such as forest management, hunting, fishing, and trapping.

State Forests and Parks are managed by the Vermont Department of Forests, Parks and Recreation to meet a variety of conservation and management goals.

Use and Management of Camel's Hump State Park and Forest is designed to:

- Conserve biological diversity on the parcel and contribute to the diversity of the larger landscape;
- Maintain and enhance forest ecosystem health;
- Maintain and enhance the parcel's ability to provide ecosystem services such as providing wood products, protecting soil and water resources, and providing recreational opportunities;
- Promote an ethic of respect for the land, sustainable use, and exemplary management;
- Conform to any and all deed restrictions, conservation easements, and legal agreements;
- Maintain or enhance quality rank of significant natural communities and protect habitat of rare, threatened, and endangered species;
- Enhance wildlife habitat through creation of balanced vegetative stages (age classes), protection and enhancement of critical wildlife habitat such as deer wintering areas, and protection of unique habitat;
- Produce a diversity of wood products through sustainable management and harvest practices;
- Maintain or enhance water quality and fisheries habitat;
- Control or limit to the extent feasible invasive species populations;
- Document, interpret, and protect historic resources;
- Provide dispersed recreational opportunities and trail systems where appropriate and compatible with other goals;

- Provide safe and enjoyable access for public uses while protecting the resource and forest access infrastructure.

Wildlife Management Areas are managed by the Vermont Fish & Wildlife Department to meet a variety of goals. Wildlife management objectives include game species such as white-tailed deer, turkey, grouse, and beaver as well as nongame species such as songbirds, small mammals, amphibians, and birds of prey. Multiple objectives are accomplished by a combination of commercial and non-commercial vegetative management practices applied over time in a manner that protects unique habitats.

Use and management of Robbins Mountain and Huntington Gap WMA's is designed to:

- Protect and enhance wetland function;
- Protect and enhance rare, threatened, and endangered species and their habitat;
- Maintain or enhance the condition of natural communities;
- Protect and enhance wildlife habitat through management of all vegetative stages; create early successional growth; improve deer wintering areas; and protect unique habitat;
- Demonstrate exemplary wildlife management practices so that practices applied here may find broader application on private lands;
- Provide sustainable, periodic timber harvesting in appropriate areas to promote wildlife habitat and forest productivity;
- Enhance opportunities for wildlife-based recreation, particularly hunting, trapping, and wildlife viewing;
- Protect and improve public access.

## **B. Location Information**

The 26,275 acre Camel's Hump Management Unit is located in the heart of Vermont's Green Mountains. Approximately 52% is in Chittenden County, 47% in Washington County, and 1% in Addison County. The approximately 40 square miles of land base that make up the CHMU is found in eight towns, Duxbury(32%), Huntington(24%), Bolton(19%), Fayston(13%), Buel's Gore(8%), Waitsfield(2%), Richmond(1%), and Starksboro(1%).

The CHMU is comprised of approximately 21,224 acres (81%) in Camel's Hump State Park; 2,561 acres (10%) in Camel's Hump State Forest; 1,602 acres (6%) in Huntington Gap WMA; and 888 acres (3%) in Robbins Mt. WMA.

The CHMU is accessed from many locations. The main approach points are from Camel's Hump Road in North Duxbury, Camel's Hump Road in Huntington, VT Route 17 in Buel's Gore and Waitsfield, Wes White Hill Road in Richmond, Bassett Hill and Dana Hill Roads in Fayston, Honey Hollow Road in Bolton, and along the Duxbury and River Roads adjacent to the Winooski River. Several parking areas are maintained for the public to access the CHMU. Refer to the Parcel Locator Map on page 15, the Parcel

Base Map on page 16, and the Parcel Blocks Map on page 17 for a better understanding of the location of the Camel's Hump Management Unit.

### **C. History of Acquisition**

The year 2011 marked the centennial of public land ownership in the Camel's Hump area. Between 1911 and 2011 there were forty-four land transactions including two gifts, forty purchases, one sale, and one swap, involving sixty-five parcels. Refer to Appendix A for a complete listing of these land transactions.

During 1911, Colonel Joseph Battell donated one gift of three parcels totaling 1,147 acres, which included the summit of Camel's Hump, thus starting a continuing process of land conservation around Camel's Hump. By the end of 1967 this land unit had grown to over 10,000 acres, or about sixteen square miles. By the end of 1979 it had grown to over 20,000 acres, about thirty-two square miles. Today the land base that makes up the Camel's Hump Management Unit is over 26,000 acres, just over forty square miles, or roughly the size of an average Vermont township.

Most of these land transactions were fee simple, without any restrictions. Some of the acquisitions are encumbered with easement restrictions, or less than fee simple purchases. As an example, much of the Huntington Gap Wildlife Management Area is timber reserved; the seller of the land retained rights to the trees on the parcel. For a complete listing of legal constraints refer to Appendix B. Additionally, FPR holds a public access easement on a property adjacent to Phen Basin in the town of Fayston.

### **D. Land Use History**

A report entitled 'The Cultural Landscape of the Camel's Hump Management Unit' was completed for the Agency of Natural Resources by the Department of Social Sciences and Business, University of Maine at Farmington during 2006 and 2007. See Appendix C for this complete report. In summary, the University of Maine report includes a brief history of the CHMU, an environmental overview, historic themes/contexts applicable to the CHMU, and recommendations for managing known and expected historic resources.

In 2003, an archeological sensitivity study was conducted by The Consulting Archeology Program of the University of Vermont that identifies environmental settings conducive to Native American occupation and land use within the CHMU; see Appendix D for this study.

The cultural and historic values of the CHMU are many and have important implications for land management into the future. Recreational use, forest products extraction, and homesteading of the lands found here started long before initiation of state land acquisition.

During the early 1800's the first trail to the summit of Camel's Hump was established (Huntington Trail, now the Burrows Trail). In the 1860's a summit house and observatory were built. Logging of the forests around the Camel's Hump area was very intense, and much of the forest was cleared during the 1800's. In the very early 1900's, two devastating forest fires burned thousands of acres. The first fire lookout in Vermont was established on the summit of Camel's Hump in 1911. In the 1930's the Civilian Conservation Corps was active within the CHMU. In 1944 a B-24 Liberator bomber crashed into the

south face of Camel's Hump. In 1968, Camel's Hump was designated as a National Natural Landmark by the US Department of the Interior.

During the tenure of state ownership of lands within the CHMU, management activities have been undertaken utilizing the multiple-use concept. A wide range of projects have been implemented, including an active, sustainable timber and firewood harvesting program, multiple trails have been established, access roads have been built and maintained, many wildlife habitat projects have been accomplished, many special use permits and licenses for use have been formulated, and several partnerships with recreation groups have been adopted.

Another prominent use of the CHMU has been for forest research. In fact, Camel's Hump plays a starring role in our current understanding of acid deposition and its impacts on forests. Long-term research plots on the west side of Camel's Hump summit documented the decline in the alpine forest health later attributed to acid deposition. This pioneering research was conducted by Hub Vogelmann, Thomas Siccama and a host of other graduate students and researchers. Vogelmann's 1982 article "Catastrophe on Camel's Hump" in *Natural History* detailed the extent and causes of the acid deposition problem and led to strong reactions among policy-makers, and eventual revisions to the Clean Air Act. Today, the forest research area is named in Hub Vogelmann's honor.

## **E. Resource Highlights**

The Camel's Hump Management Unit is a large nearly completely forested land unit. The dominant forest component is northern hardwood, comprised mostly of the sugar maple-beech-yellow birch community. Even though the northern hardwood type covers much of the CHMU, the variety of flora and fauna found here is impressive.

The CHMU is located in the Northern Green Mountains biophysical region, which encompasses the mountains in the north-central portion of Vermont. This region is part of the Appalachian Mountain system that stretches across much of the eastern side of North America. As a result of the relatively high elevations, this region has higher levels of precipitation, lower temperatures, and a short growing season. The terrain is rugged, and contains some of Vermont's tallest peaks. The metamorphic bedrock is acidic and lacks the limey, nutrient rich soils found in neighboring lowlands. Glacial till covers much of the region.

While soil types vary across the CHMU, Lyman-Marlow very rocky loams are dominant. Other soil types found here include the very rocky Hogback-Rawsonville complex, Peru extremely stony loam, and the very rocky Ricker-Londonderry-Stratton complex. Soils along the Winooski River area are of the Limerick-Hadley-Winooski Association, which are loamy soils subject to periodic flooding. Slopes graduate from flat along the Winooski River to extremely steep; generally, steep slopes are a limiting factor for planned activities.

Precipitation amounts over the landscape of the CHMU range from around sixty inches per year in the upper elevations to half that in the lowest elevations. Rain, snow, and cloud intercept all contribute to the precipitation amounts. Within the CHMU there are few open bodies of water; beaver ponds make up this component. All of the CHMU is within the greater Lake Champlain basin, and as such run-off from this land unit eventually drains into the lake. Main tributaries include the Winooski, Huntington, and Mad Rivers, and Ridley, Preston, Gleason, Brush, Cobb, and Beaver Meadow Brooks.

The landscape diversity found on the CHMU results in a wide variety of natural community types, from Alpine Meadow at the summit, to floodplain forest along the Winooski River. The CHMU is within one of the state's largest unfragmented habitat blocks, and there is an abundance of wildlife within the CHMU including black bear, white-tailed deer, moose, ruffed grouse, bobcat, beaver, a wide variety of song birds and raptors, brook trout, fox, snowshoe hares, and amphibians and reptiles. Critical wildlife habitats have been identified for many of these species on the CHMU.

Given the challenging terrain on much of the CHMU, past homesteading was somewhat limited. Along river and road corridors can be found remnants of past human habitation. Much of this occurred in the mid to late 1800's and early to mid-1900's. Former logging and hunting camp sites are also found here.

Recreational use has long been a tradition within the CHMU. Trails started to be established in the mid 1800's. The land base of the CHMU is within a day's drive of several major metropolitan areas in both the United States and Canada, with two-thirds of Vermont's population living within one hour's drive of the CHMU. As such, the CHMU attracts many thousands of visitors each year. Hiking, cross country skiing, hunting, primitive camping, snowmobiling, fishing, and wildlife observation are popular pursuits. Even though some of the trails are extremely popular, there are many places within the CHMU that are quite remote, and rarely visited.

There are no developed campgrounds located on the CHMU. In conjunction with the Long Trail there are a few remote shelters and one tenting area. Primitive, off trail camping is allowed in the lower elevations on some of the CHMU.

## **F. Relationship to the Regional Context and Other Planning Efforts**

When a long-range management plan is developed for state land, it is important to take a broader view beyond the parcel itself. Part of this effort is to examine the relationship of the planning effort for the state land parcel to regional and town plans. It is important that as plans are made and management activities are carried out that land managers keep in mind the larger picture. The regional plans and town plans for the area within which the CHMU is located are comprehensive, with a substantial amount of effort put into formulating them. These plans are pertinent to the context of the long-range plan for the Camel's Hump Management Unit, and have been considered in the development of this plan.

The Camel's Hump Management Unit comprises acreage in eight towns and three counties. A comprehensive review of the relevant portions of each town plan is beyond the scope of this section. Suffice it to say, that every county plan and town plan (save Buel's Gore) identifies the importance of resource protection, wildlife populations and habitat, working landscapes, recreational opportunities and the scenic character of each community. The Camel's Hump Management Unit will play an important role for the towns, especially in Duxbury, Huntington, and Bolton where 75% of the acreage lies, and where state-owned land comprises a significant amount of the town's total acreage.

The Huntington town plan would set out to "ensure adequate protection and preservation of rare, sensitive, or important natural resources and prime agricultural soils." Among the many natural resource goals identified in the Bolton town plan is to "maintain, restore and conserve habitats and natural communities that support rare, threatened and endangered species." Duxbury's town plan emphasizes that the town's "economic base includes a robust working landscape". It even encourages "responsible logging" specifying that forest harvesting should utilize a professional forester and long-

term forest management plans. Fayston's town plan clearly states the importance of maintaining "Fayston's recreational opportunities for the young and old for all seasons."

While it is important that town plans tout the value of natural resources, working landscapes, wildlife habitat and recreation opportunities, it is equally important that town zoning ordinances are written to help achieve these goals. For the most part, the zoning in surrounding town aligns reasonably well with the goals of the CHMU, with some towns delineating zones by elevation. However, additional growth is likely to occur adjacent to the CHMU.

North Duxbury has seen significant development near the CHMU. Portions of the CHMU are bordered by the "Forest Recreation" zone, where 5 acres is the minimum lot size. Fortunately this zone does not border any Highly Sensitive Management Zones in the CHMU (see Section IV.C.). In Huntington, small portions of the CHMU are bordered by the "Rural-Residential District" (5 acre minimum lot size), but like in Duxbury, none of these areas are considered Highly Sensitive.

In Bolton, the "Rural I" District has 2-acre zoning and borders the CHMU between the Gleason Brook watershed and the Duxbury Road. Again, this zone does not border any Highly Sensitive areas, but is only 400 feet from the Highly Sensitive area comprising the Gleason Brook watershed.

In Fayston, the "Soil and Water Conservation District" has 5-acre zoning and borders significant portions of the CHMU. The "Rural Residential District" has 1 acre zoning and also borders some of the CHMU, including a Highly Sensitive beaver wetland complex.

In Waitsfield, the "Agricultural Residential District" has 1 acre zoning and lies adjacent to the majority of the Howe Block of Camel's Hump State Forest, including a deer wintering area. Robbins Mtn. WMA in Richmond is adjacent to the "Agricultural and Residential" zoning district with a minimum lot size of 1 acre.

Widespread and rapid development of the lands adjacent to the CHMU is unlikely. However, the towns and ANR should remain vigilant in monitoring development and reacting appropriately should this development threaten the goals in either the town plans or this plan.



Figure 1- Locator Map

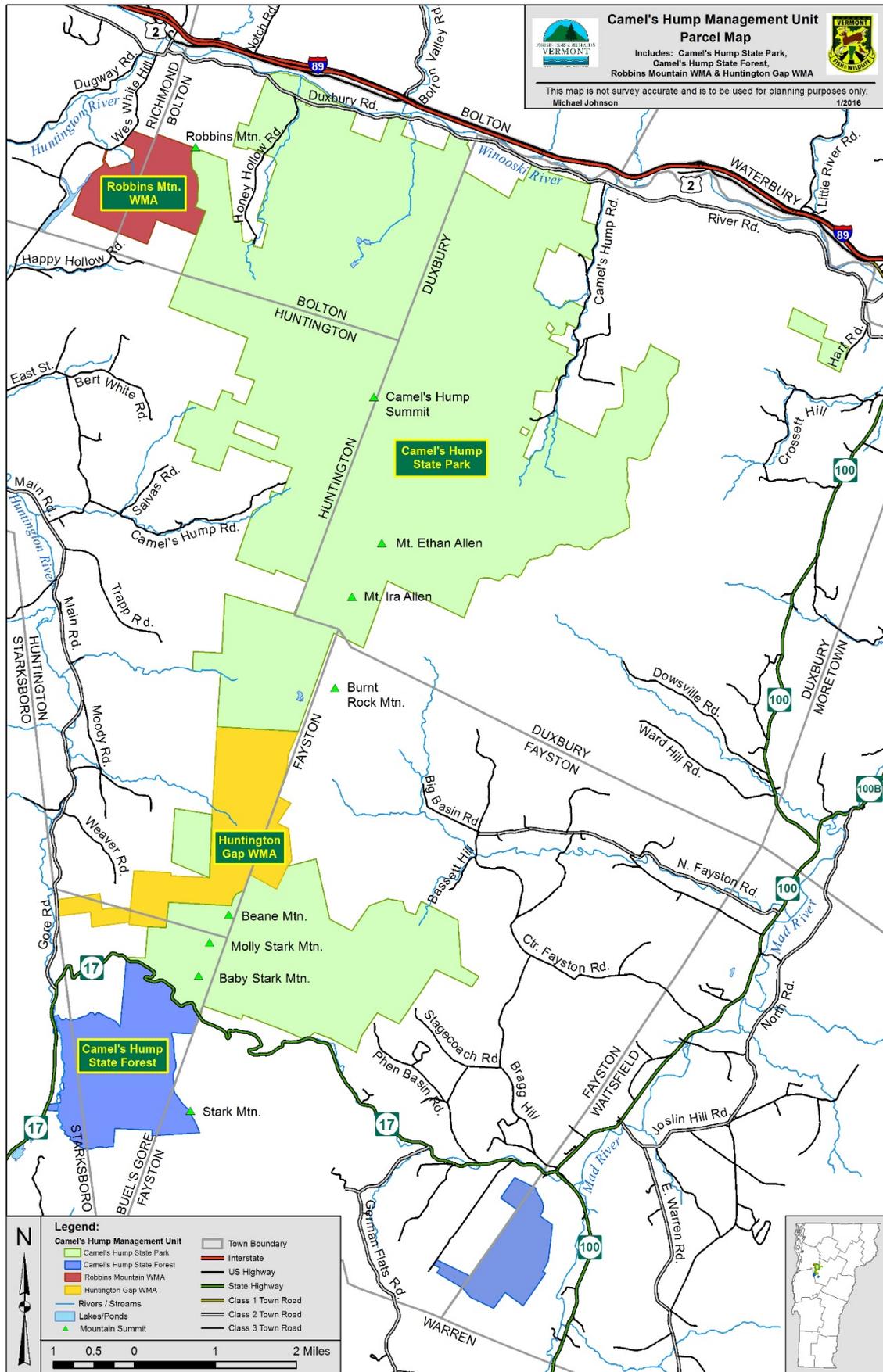


Figure 2- Parcel Base Map

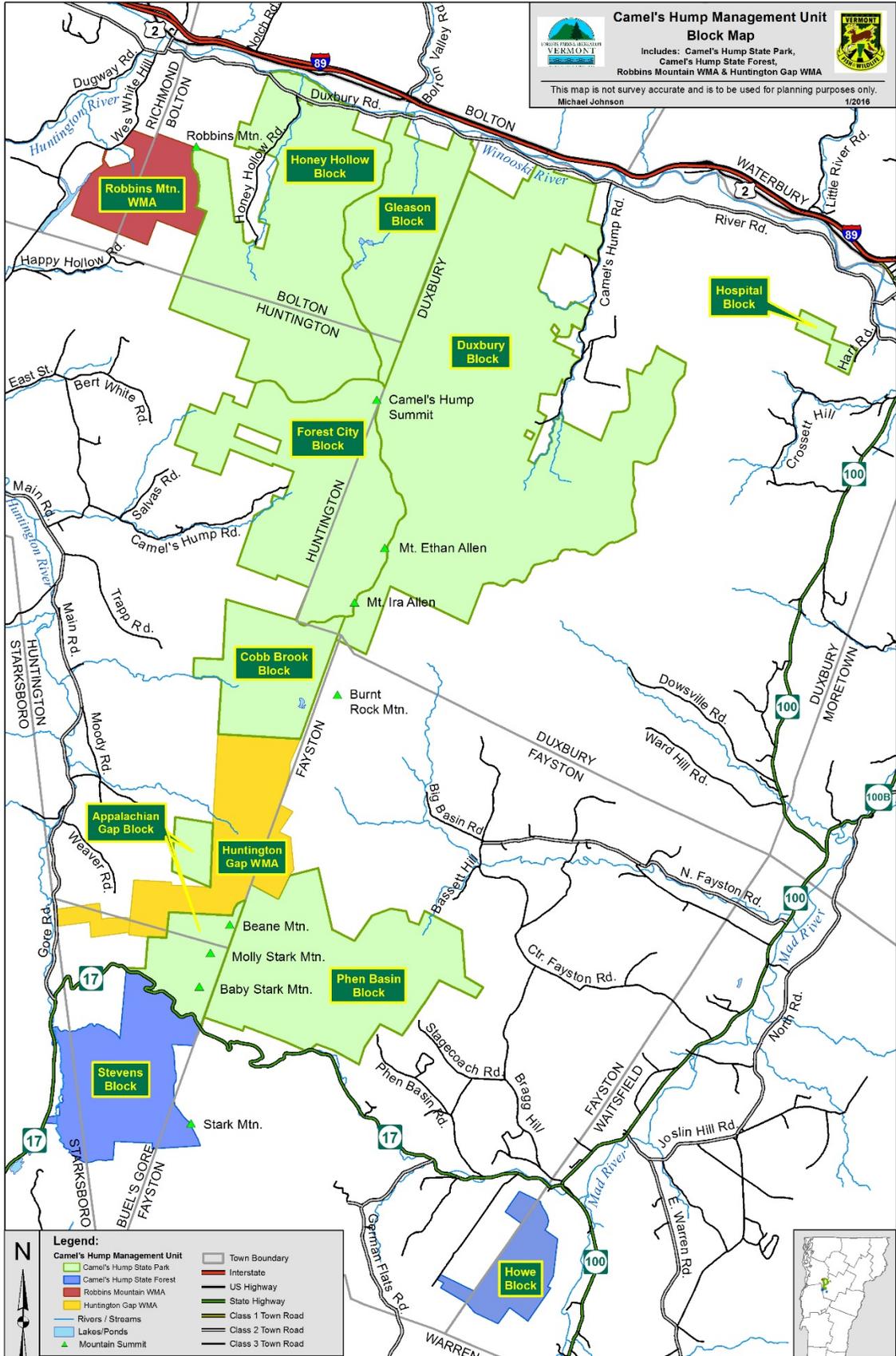


Figure 3- Parcel Block Map



## II. PUBLIC INPUT

As the resource steward for state parks, forests, and wildlife management areas, the Vermont Agency of Natural Resources must make decisions about the public good which span current and future generations. Comments from the public are taken as advice by ANR. The purpose of public involvement is not to institute majority rule management of public land. However, in developing management plans, every effort will be made to include suggestions which are compatible with ANR and its Department's missions; compatible with ANR lands management principles and goals; and which are fiscally realistic.

Public involvement, or citizen participation, is a broad term for a variety of methods by which the people of Vermont have input to public land management decisions. Recognizing the value of the public's role, ANR is committed to seeking and incorporating the public's ideas for the management of these lands. ANR is also committed to explaining how its lands planning process works, how people can participate, how lands are managed on an ongoing basis, and how final management decisions are made.

Public input to the planning for and management of the CHMU has been, and continues to be an ongoing process. This input takes many forms including e-mails, letters, phone calls, comments in trail-head register boxes, meetings with partnering organizations and the public and informal in-person discussions. The staff involved with the planning and management of the CHMU considers all of this information on a continuing basis.

The formal citizen participation process for the Camel's Hump Management Unit has involved different techniques. Three on-line surveys were conducted during 2011. Public scoping meetings were held on June 14, 2011 at Huntington's Brewster Pierce Elementary School and on June 15, 2011 at Duxbury's Crossett Brook Middle School. Results from the surveys and summaries of comments from the public meetings as well as a summary of the State's response to this input can be found in Appendix E.

## III. RESOURCE ANALYSIS

### A. Legal Constraints

Given that the Camel's Hump Management Unit was assembled over nearly one hundred years involving 44 different transactions, there are many legal constraints on the parcel. These constraints include utility easements, rights-of-way, life time leases, timber reserve rights, deed restrictions, funding source restrictions, Act 250 permits, spring rights, and town, state and federal legislation. A full listing of the legal constraints on the CHMU can be found in Appendix B, Parts 1 and 2. A stand-alone Legal Constraints map was not prepared for this plan. By utilizing the Legal Matrix charts in Appendix B, along with the Land Transactions History maps within Appendix A, this information can be obtained.

Summary of Major Legal Constraints on the CHMU:

#### 1. Deed Restrictions

- Gift from Col. Joseph Battell of 1,147 acres, including the summit of Camel's Hump; includes clauses restricting tree cutting, and preserving the forest in a natural condition.
- Gift from the Will Monroe estate of 110 acres in North Duxbury was given with the understanding that the land would be used as a bird sanctuary, game refuge, wild flower, fern, shrub and tree preserve, and public park. It also allowed public access with parking, picnic grounds, and trails.
- Timber rights were reserved in perpetuity on 1,473 acres of the 1,602 acre Huntington Gap Wildlife Management Area; these rights are currently held by the A. Johnson Company of Bristol, Vermont.
- Purchase deed of 462 acres in Bolton from Leo Lafreniere states that the property may be used for agriculture, forestry, educational, non-commercial recreation, and open space purposes in accordance with the Management Plan. No residential, commercial, industrial, or mining activities are permitted. There may be no construction of buildings or structures, nor may any be moved, created, or erected unless it is in accordance with the Management Plan, furthers the public use as a part of the state park, protects the environmental systems, encourages sound utilization and conservation of agriculture and forest resources, or preserves the scenic beauty of the property. The state is to make every effort to keep the property in its current agricultural use. The property may not be subdivided, conveyed into separate parcels, or transferred, unless permission is given by the Easement holder. (Note: The Legislature and the Vermont Housing and Conservation Board (VHCB) have approved the sale of a portion of the former Lafreniere homestead parcel. FPR is currently pursuing the sale of the house and 30 acres, subject to various open space and historic preservation restrictions.) Should the property not be used according to the grant agreement then the land will revert back to the VHCB.
- Purchase deed of the 2,700 acre Phen Basin parcel in Fayston included a complex set of restrictions including designation of an Ecological Protection Zone on approx. 80% of the parcel. A full listing of the restrictions attached to this property can be found in Appendix B.

## 2. Legislation

- In 1969 the Vermont General Assembly passed Title 10, Chapter 77, Sections 2351-2354, further amended in 1973 and 1975. This legislation created the Camel's Hump Forest Reserve and named the state land base within this area Camel's Hump State Park, so that at least one mountain in the Green Mountain Range should be reserved in its 'natural' state. It further directed that this land would be managed by the Department of Forests, Parks and Recreation to maintain the present near-wilderness aspect of the region for present and coming generations, to preserve the habitat in its natural form, to protect scarce and rare plants found in the region, and to protect the ecological area from encroachment, and established three Use Districts. The Camel's Hump Forest Reserve is defined as the area bounded by Winooski River on the north, the Mad River on the east, VT Route 17 on the south, and the Huntington River on the west. The three use districts within the Camel's Hump Forest Reserve are:
  - 1) Ecological Area- This area is for protection of scarce and rare plants, and to preserve the natural habitat and to maintain the wilderness aspect. This area extends from 2500' elevation to the summit and from 900' elevation to 2500' elevation within the Gleason Brook drainage.
  - 2) Timber Management and Wildlife Area- This area shall be for production of forest products, to protect the ecological area, to encourage wildlife habitat, and to preserve the natural appearance of the region as seen from surrounding areas. This area extends from 1800' elevation up to the ecological area. Uses of this area will include sustained production of

timber, water conservation, wildlife management, hunting, hiking, cross-country skiing and nature appreciation.

3) Multiple-Use Area- This area is the balance of the land, below 1800' elevation. Uses of this area shall include farming and vacation and permanent residences in addition to those uses enumerated in the timber management and wildlife area.

In addition to the uses stipulated in the three use districts, FP&R may establish other permitted uses in conjunction with the development and adoption of a comprehensive management plan. Due consideration shall be given to the relationship and compatibility of such permitted uses with the purposes established for each of the three use districts.

### 3. Funding Restrictions

- The Huntington Gap and Robbins Mountain Wildlife Management Areas were acquired with funds provided by the Federal Aid in Wildlife Restoration Act more commonly known as the Pittman-Robertson Wildlife Restoration Act which provides federal aid to the states for management and restoration of wildlife and respective habitats. This federal aid, funded through an excise tax on sporting arms and ammunition, may be used to support a variety of wildlife projects, including the acquisition of wildlife habitat. Management activities and land uses on parcels funded with Pittman-Robertson funds must be consistent with the objectives of protecting, restoring, or improving habitat for wildlife. Recreational activities may be restricted to those activities which meet stated objectives.
- In Camel's Hump State Park and State Forest, approximately 9000 acres were conserved in part through funding from the Land and Water Conservation Fund (LWCF). These include large parcels such as the Laird property in Duxbury, the Colgan property in Bolton, former TNC ownerships in Bolton and Duxbury, as well as the Indian Head Plywood company lands in Bolton and Huntington. Several other smaller parcels were also conserved in this fashion for a total of eleven transactions (See Appendix B). LWCF funds are used to conserve properties with important outdoor recreational value. Public access for recreational purposes is to be preserved in perpetuity. On these properties, management for other purposes (forest products, wildlife, etc.) is permitted as long as it does not permanently impact the recreational values of the property.

## B. Natural Communities and Ecological Assessment

ANR uses a "coarse filter/ fine filter" approach to the ecological inventory and assessment of state lands (Jenkins 1985; Noss 1987; Hunter et al. 1988; Hunter 1991; Noss and Cooperrider 1994; Hafler et al. 1996; Jenkins 1996; Poiani et al. 2000). Widely employed as a management tool on state, federal, and private lands (see for example: Leslie et al. 1996; Committee of Scientists 1999; Stein et al. 2000; USFS 2000, 2004), it is an aid to land managers who seek to protect most or all of the species that naturally occur on their lands, but who lack the resources to make exhaustive inventories of all taxonomic groups. Because many groups of organisms are cryptic or poorly understood (for example, fungi and soil invertebrates), it is not practical to make lists of all of them (Anderson et al. 1999; Willis and Whittaker 2002). Even if we could assemble such lists of species, it would be impossible to manage the land with all of them in mind. Instead, natural communities are treated as a proxy for the biological organisms of which they are composed. It is thought that if examples of all of Vermont's natural communities are

conserved at the scale at which they naturally occur, most of the species they contain, from the largest trees and mammals to the smallest insects, will also be conserved (NCASI 2004). Natural communities are thus a coarse filter for “catching” the majority of an area’s native organisms. Because conservation of habitats (in the form of natural communities) will not protect all species, we also employ a “fine filter” to catch the remaining species that are known to require very specific conditions for their growth, reproduction, wintering, etc. Examples of organisms benefiting from the fine filter inventories described below include breeding birds, deer on their wintering areas, and rare plants.

The coarse filter assessment begins by describing landscape and climatic factors that characterize the CHMU, such as bedrock geology and water resources. It then details the 26 distinct natural community types documented and mapped during inventories of the CHMU. This is followed by a fine filter assessment describing rare species, invasive plants, and wildlife habitats found here.

## **Coarse Filter Assessment**

### Biophysical Region and Climate

Vermont is divided into eight biophysical regions where climate, topography, geology, human history, and natural communities tend to be similar (Thompson and Sorenson 2000). The CHMU is located in the Northern Green Mountains biophysical region, which encompasses the mountains in the north-central portion of the state. It is bounded by the lowlands of the Champlain Valley to the west and the rolling terrain of the Northern Vermont Piedmont to the east. This region is part of the Appalachian Mountain system that stretches across much of the eastern side of North America. As a result of the high elevations, the region has high levels of precipitation, low temperatures, and a short growing season. The terrain is rugged, and contains some of Vermont’s tallest peaks, including Camel’s Hump. The metamorphic bedrock is generally acidic, and the region lacks the limey, nutrient-rich soils found in the neighboring lowlands. Glacial till covers much of the region, but other glacial deposits and modern-day alluvium are also present in the valleys.

### Bedrock Geology, Surficial Geology, and Soils

The geologic history of an area can have a strong influence on the distribution of natural communities. Bedrock underlying the CHMU is primarily metamorphic sedimentary rock dating to the Cambrian era, roughly 550 million years ago. The most widespread rocks are schist and gneiss of the Underhill, Hazen’s Notch, Fayston, Granville, and Pinney Hollow formations. These folded, erosion-resistant rocks are evident in the many outcrops and cliffs scattered throughout the CHMU. Although both are generally acidic rocks that do not contribute to soil enrichment, the Hazen’s Notch formation can have lenses of marble which may be responsible for some of the localized enrichment found in the CHMU.

The degree to which this bedrock affects growing conditions in the CHMU is mediated by the depth of the surficial materials deposited at the end of the last glaciation, some 15,000-12,000 years ago. As the glacier ice melted, rock fragments of all sizes, from boulders to clay, fell in an unsorted jumble known as glacial till. This till covers the majority of the CHMU, and varies in depth from very shallow to extremely deep. Many of the summits and ridges have large expanses of exposed bedrock; these may never have

had a thick layer of till deposited or post-glacial disturbances and erosion may have removed the original till deposits. Glacial till is also present in the valleys, but subsequent depositions of sediments and organic matter have buried much of the till, particularly in the Winooski Valley which has a more complex post-glacial history and therefore a complex surficial geology. Kame terraces, glaciolacustrine deposits of gravel, sand, silt and clay, and modern-day alluvium can all be found at low elevations in the valley.

The soils of the CHMU are primarily the products of these surficial deposits, and as such are mostly till-derived, rocky and stony soils. The most widespread series mapped by the NRCS is Lyman-Marlow very rocky loams, which cover over 6,000 acres of the CHMU. Other widespread soil series include the very rocky Hogback-Rawsonville complex, Colonel sandy loam, Peru extremely stony loam, the very rocky Ricker-Londonderry-Stratton complex, and the Tunbridge-Lyman complex. In contrast, the Winooski Valley features sandy and silty loams, including the Berkshire, Hadley, Hartland, Salmon and Stetson series. An area of Cabot silt loam is mapped near Tucker Hill Road on the Howe Block. No peat or muck soils have been mapped by the NRCS in the CHMU, but these organic soils are found in the small wetlands scattered around the parcel.

#### Hydrology

The Northern Green Mountains have on average the highest precipitation levels in Vermont, but the amount any particular site receives is highly dependent on elevation and aspect. The highest elevations on the ridge receive around 60" of precipitation per year, but sites near Duxbury in the Winooski Valley may receive only half that amount. Other than a few small beaver ponds, there are no major water bodies within the CHMU. The terrain is drained by numerous streams which all eventually reach the Winooski River, either directly, or via the Mad River to the east or the Huntington River to the west. Because of high precipitation and shallow-to-bedrock soils, groundwater seepage can be abundant at higher elevations; the larger flowages result in a characteristic seep-adapted wetland flora; smaller flows produce mesic (and productive) forest soil. Surface water also collects in depressions to form vernal pools, and other small wetlands are scattered around the CHMU and provide important landscape diversity that supports many species of plants and animals.

#### Natural and Human Disturbance

Natural and human disturbances have both played a role in shaping the natural communities of the CHMU. Natural disturbance is primarily the result of wind, ice, or insect damage to individual trees or small patches, resulting in small canopy gaps. Large-scale blowdown or ice storm events are normal processes, but very infrequent – occurring on the order of every 1,000 years for a large blowdown (Lorimer and White, 2003). Natural fires in the absence of human disturbance are infrequent events as well. In many wetlands beaver disturbance is a regular process. Along larger streams and the Winooski River, flooding and ice scouring are frequent disturbances.

Human disturbance has played a major role in shaping the CHMU. Much of the land was very heavily harvested for timber during the late 1800s, with very high demand for red spruce (*Picea rubens*). As a result red spruce may be much less abundant in some natural communities now than it was 200 years

ago. The extensive logging, and the associated accumulation of slash, led to two very large fires: the first in 1903 burned thousands of acres around the Camel's Hump summit, and the second in 1908 burned a large area around Robbins Mountain. Thus, many areas of forest were established after these fires. Many locations on the CHMU were utilized for agriculture, including sheep grazing, and maple sugaring. Evidence of these activities can be seen with remains of stone walls and the occasional remnants of a sugarhouse. In places there was also extensive tree planting, and today it is still possible to find non-native Norway spruce (*Picea abies*) in improbable locations high on Camel's Hump.

More recently, Camel's Hump became an important research site for studying the effects of acid rain. Starting in the 1960s, researchers began observing extensive decline in red spruce. While improved air quality regulation seems to have moderated the red spruce decline, acid rain is not the only diffuse disturbance affecting the CHMU: a study by University of Vermont researchers (Beckage et. al., 2008) reported evidence that the transition between northern hardwood forests and montane boreal forests is moving upslope, possibly in response to a warming climate. Finally, recreation is a notable form of human disturbance in some parts of the CHMU. Two activities in particular—the trampling of the alpine zone by hikers and dogs, and the illegal clearing of trees and brush to create informal backcountry ski glades—pose potential threats to sensitive natural communities that are easily damaged but slow to recover. While all of these recent disturbances may be more diffuse and subtle than the past human influences, they nevertheless continue to shape the landscape.

## **Natural Communities**

A natural community is an assemblage of biological organisms, their physical environment (e.g., geology, hydrology, climate, natural disturbance regime, etc.), and the interactions between them (Thompson and Sorenson 2000). More than a simple collection of species, a natural community is characterized by complex webs of mutualism, predation, and other forms of interaction. The 89 natural community types described in Vermont repeat across the landscape in patches (or “polygons”) of various sizes. These patches (or groups of patches in close proximity to each other) are referred to as natural community occurrences, and are to be distinguished from broad descriptions of community types. Natural community occurrences vary greatly in their size. Matrix communities, such as Northern Hardwood Forests, occur in broad expanses across the landscape, and form the context in which other, smaller communities are found. Large patch communities, such as Mesic Red Oak-Northern Hardwood Forest, typically occur at scales of 50-1000 acres. Small patch communities such as Seeps or Boreal Outcrops are usually less than 50 acres in size; many are much smaller and owe their existence to highly localized site and disturbance characteristics.

Natural communities in the CHMU were identified through aerial photograph interpretation and field surveys. A Geographic Information System (GIS) map of natural communities was produced using ArcView software from ESRI, Inc. Because some natural communities occur at very small scales (e.g., less than ¼ acre), this mapping effort is probably incomplete. Natural community mapping is an iterative process, and our knowledge improves with each mapping effort. Thus, the maps presented in this plan should not be viewed as a final statement on community distribution in the CHMU; instead,

they should be treated as a first attempt at describing natural communities in this area. Land managers and members of the public should be aware that additional examples of small patch natural communities (e.g., vernal pools and seeps) probably occur on the management unit. As subsequent inventories and site visits are conducted, these maps will be improved.

Natural community occurrences are assigned a quality rank, a statement of their overall ecological value which helps guide management. An “A”-ranked occurrence is of high quality relative to others of its type in the state, while a D-ranked example is of comparatively low quality. Quality ranks are objectively assigned on the basis of three factors: occurrence size, current condition, and landscape context. The three factors vary in the degree to which they influence overall quality in different communities. For example, size and landscape quality are more important factors than current condition in the quality ranking of Northern Hardwood Forests, while current condition and landscape context receive greater attention in the ranking of Rich Northern Hardwood Forests. It is important to recognize that assignment of low quality ranks may be due to small size rather than poor current condition. When community occurrences are either rare or of high quality (or a combination of these factors), they may be designated as being of “statewide significance”. This designation is applied according to objective guidelines established by the Vermont Department of Fish and Wildlife and which are available upon request. State-significant natural communities will be afforded a higher level of protection than other areas of the management unit.

In all, 126 occurrences of 26 natural community types were identified and mapped in the CHMU (see table on page 27). A total of 444 natural community polygons were mapped.

Some broad patterns emerged from this mapping effort. First, and not surprisingly, the CHMU is characterized by the extensive matrix forest community types: Northern Hardwood Forest at lower elevations, and then Red Spruce-Northern Hardwood Forest, Montane Yellow Birch-Red Spruce Forest, and Montane Spruce-Fir Forest as elevation increases. These communities combine to form one of the largest unbroken forest blocks in the state, and are all of high ecological quality and of statewide significance. Within this forested matrix are all the other communities, including the very distinctive alpine communities found at the summit of Camel’s Hump. The Alpine Meadow and Subalpine Krummholz are both very rare in Vermont, and restricted to the tops of the highest mountains. The Alpine Meadow in particular hosts numerous rare, threatened and endangered plants, many of which are more commonly found in arctic tundra hundreds of miles further north. Other communities found in the CHMU include cliffs and outcrops, which are abundant in the mountainous terrain. Small patch wetlands are also common, occurring in both closed basins and as a result of groundwater seepage, but for the most part these are not defining characteristics of the landscape. Groundwater flow can result in open seeps and seepage swamp communities, which have a specially adapted flora component. In addition, numerous Vernal Pools are found throughout the management unit, providing important amphibian breeding habitat. These small wetlands are easily impacted by changes in hydrology or canopy cover.

For more detailed information on the natural communities of the CHMU refer to Appendix F.

### Natural Communities of the Camel's Hump Management Unit

Natural Community	Acres	Vermont Distribution	Example of Statewide Significance?
<b>Wetlands</b>			
Beaver Wetland	53.6	very common	
Hemlock-Balsam Fir-Black Ash Seepage Swamp	2.2	uncommon	
Red Maple-Black Ash Seepage Swamp	4.6	common	
Red Spruce-Cinnamon Fern Swamp	10	uncommon	yes
Seep	68	common	yes
Silver Maple-Ostrich Fern Riverine Floodplain Forest	42	uncommon	
Vernal Pool	1.6	uncommon	yes
<b>Uplands</b>			
Alpine Meadow	5	very rare	yes
Boreal Acidic Cliff	0.7	common	yes
Boreal Outcrop	70	common	yes
Boreal Talus Woodland	1	uncommon	
Hemlock Forest	154	common	yes
Hemlock-Balsam Fir-Black Ash Swamp	0.2	uncommon	
Hemlock-Northern Hardwood Forest	1,051	common	yes
Lowland Spruce-Fir Forest	61	uncommon	yes
Mesic Red Oak-Northern Hardwood Forest	56	common	yes
Montane Spruce-Fir Forest	4,055	uncommon	yes
Montane Yellow Birch-Red Spruce Forest	4,331	uncommon	yes
Northern Hardwood Forest	14,274	very common	yes
Northern Hardwood Talus Woodland	7	uncommon	
Red Spruce-Heath Rocky Ridge Forest	484	uncommon	yes
Red Spruce-Northern Hardwood Forest	460	common	yes
Rich Northern Hardwood Forest	593	common	yes
Softwood Plantation* (Howe Block)	89	n/a	
Subalpine Krummholz	14	very rare	yes
Temperate Acidic Cliff	0.3	common	
Temperate Acidic Outcrop	25	common	yes
Temperate Calcareous Cliff	2	uncommon	

*\*Softwood Plantation acreage included for reference only*

For more information on these and other natural communities, see *Wetland, Woodland, Wildland: a Guide to the Natural Communities of Vermont*, by Elizabeth Thompson and Eric Sorenson. Information may also be found online at: <http://www.vtfishandwildlife.com/books.cfm?libbase=Wetland,Woodland,Wildland>

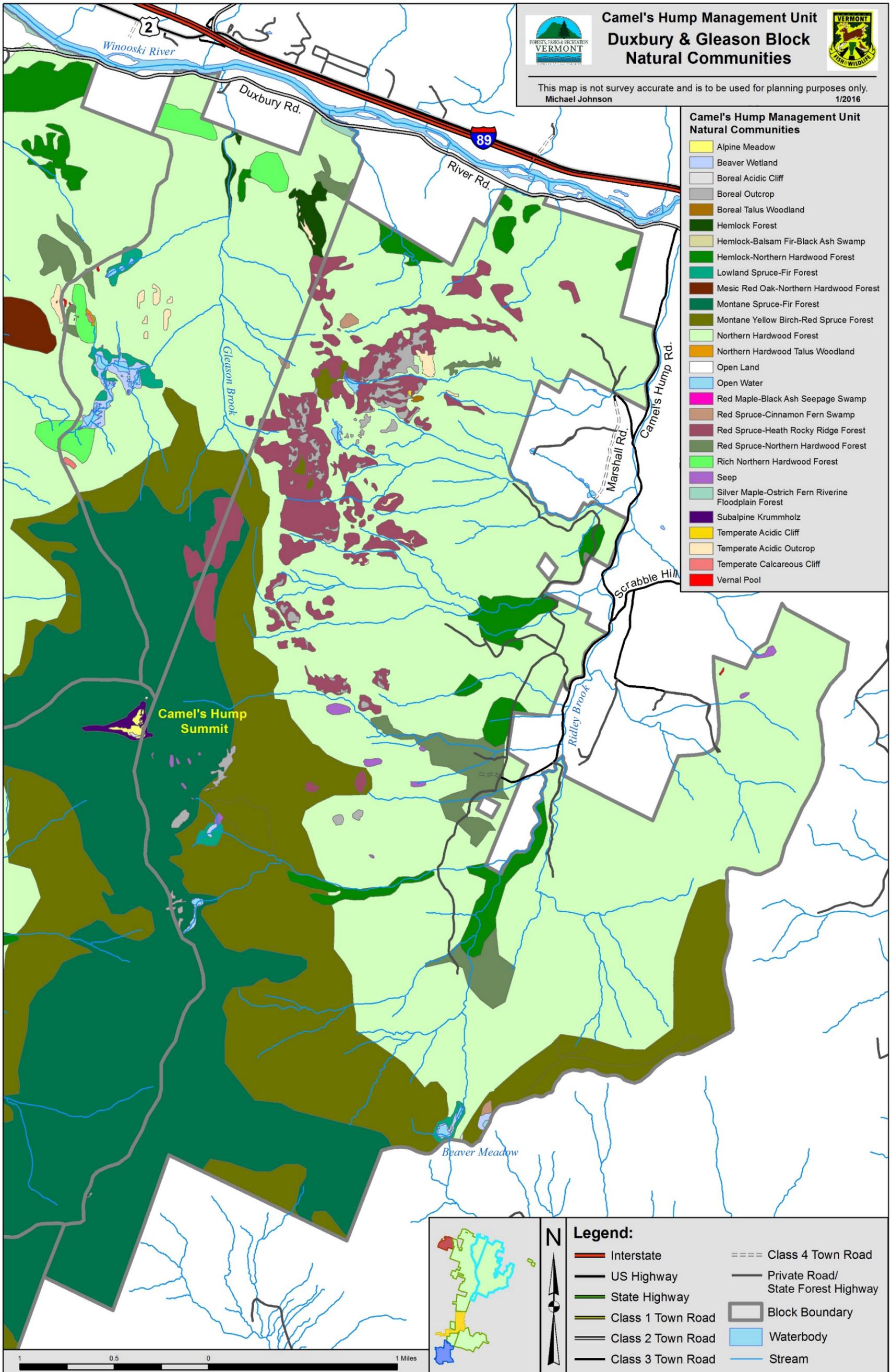


Figure 5- Natural Communities Map, Duxbury & Gleason Blocks

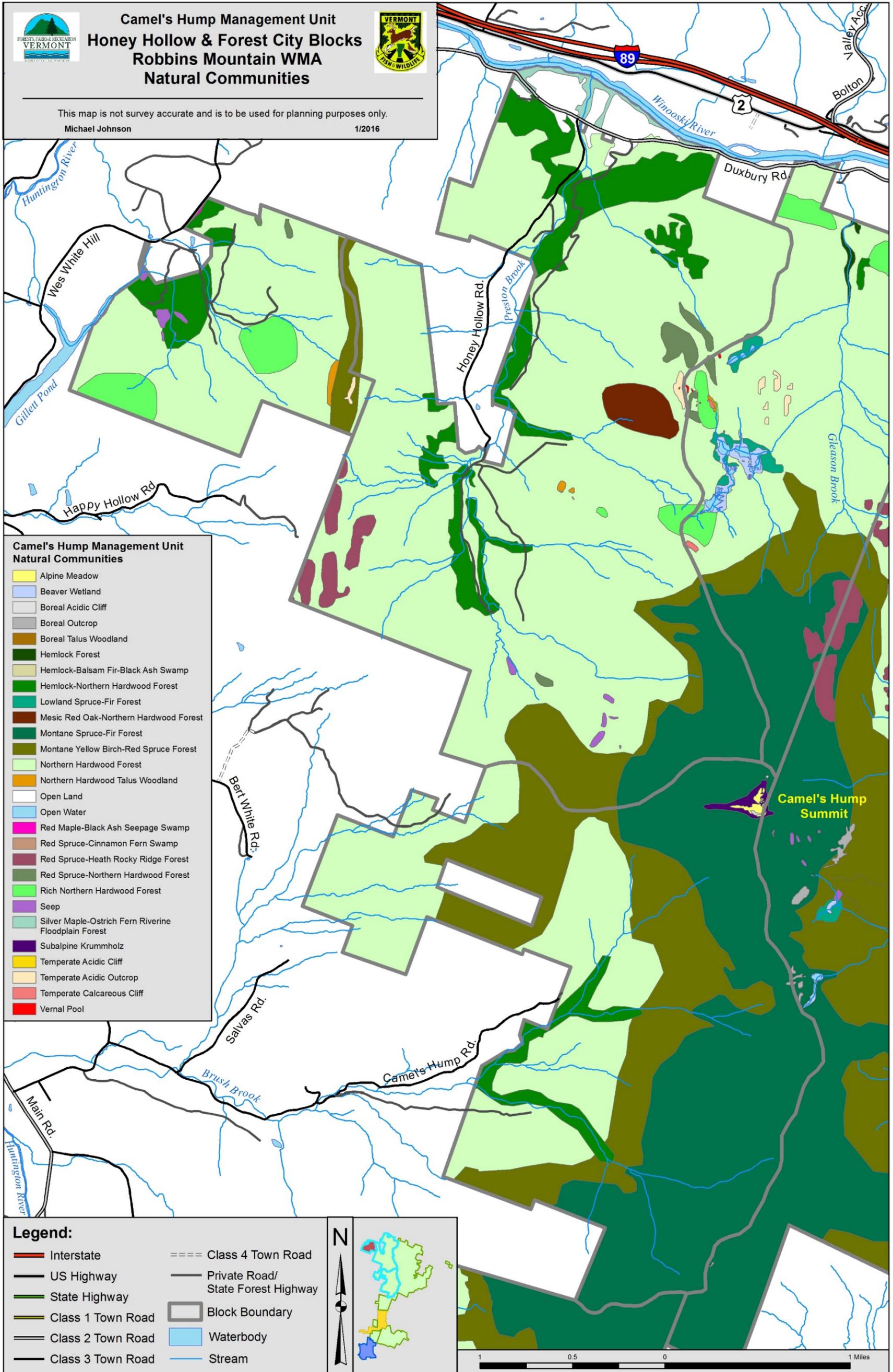
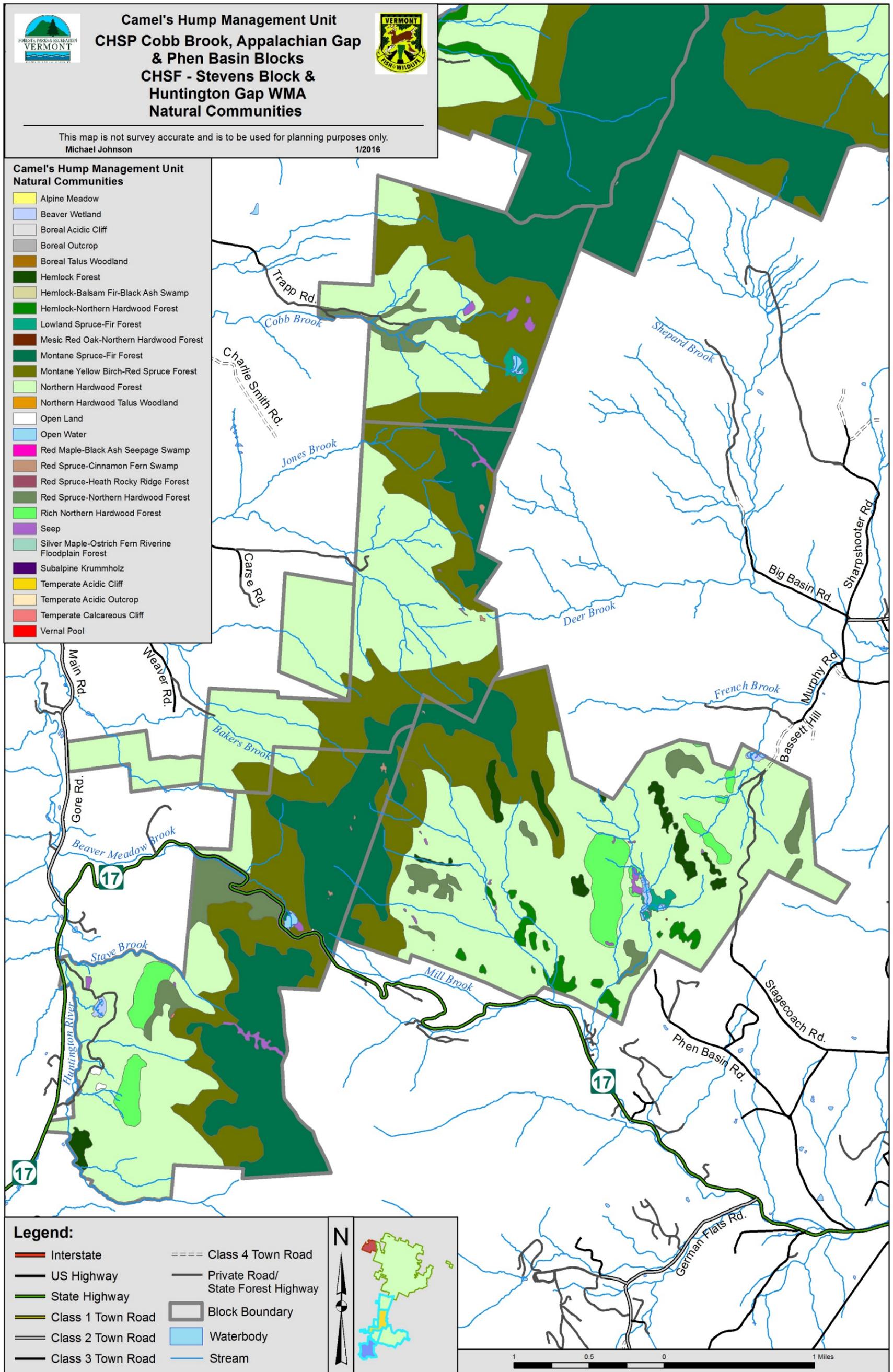


Figure 6- Natural Communities Map, Honey Hollow & Forest City Blocks



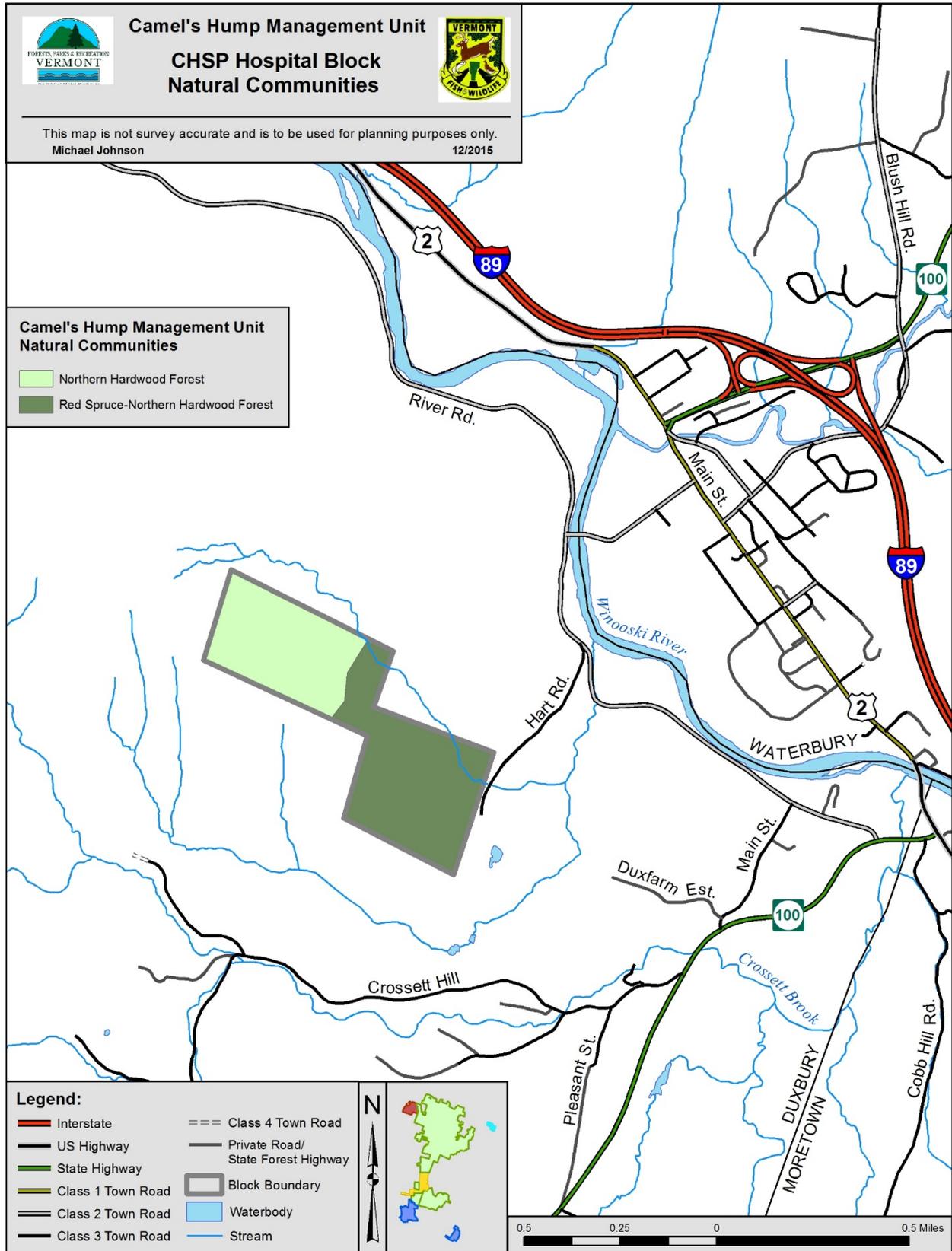


Figure 8- Natural Communities Map, Hospital Block

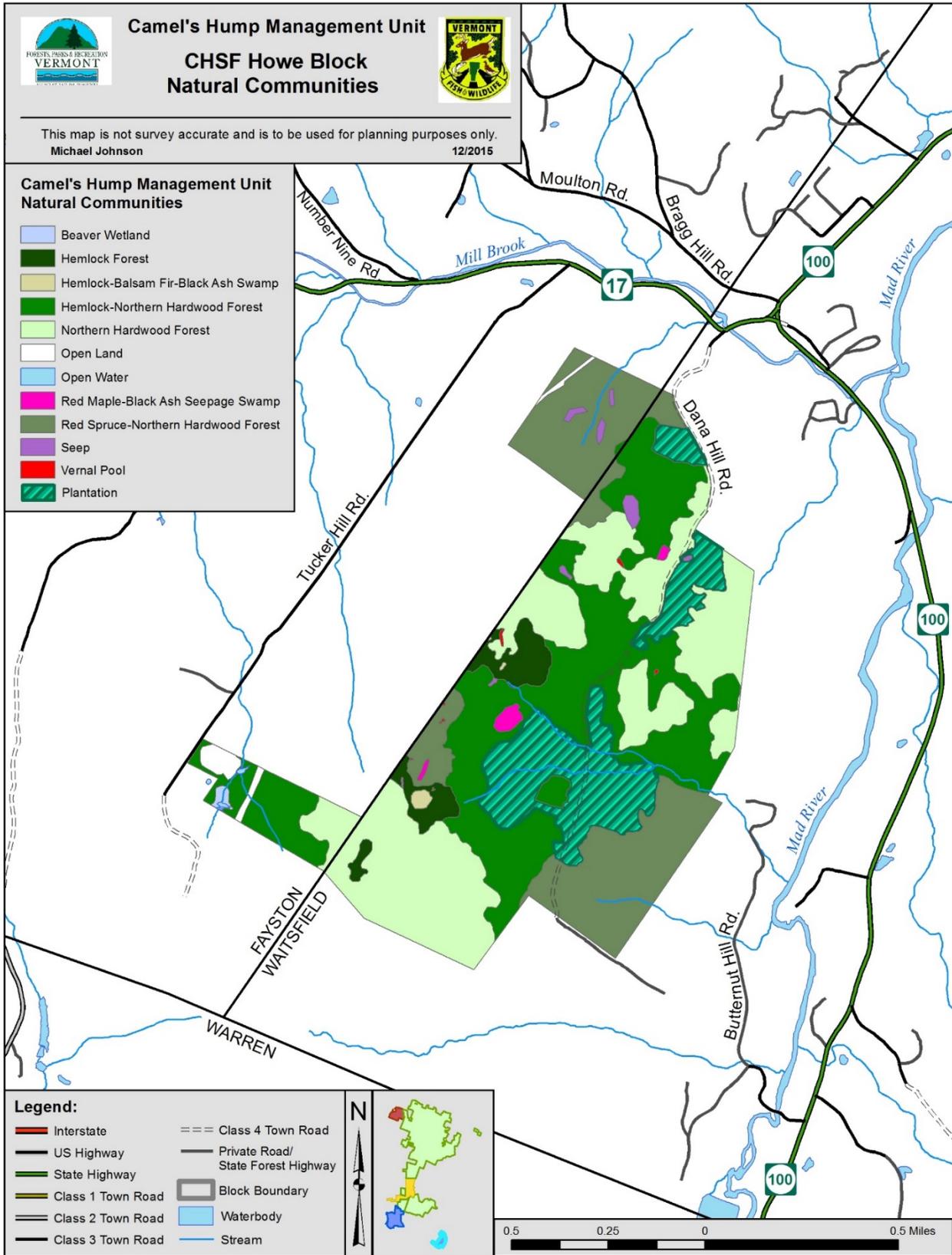


Figure 9- Natural Communities Map, Howe Block

## Fine Filter Assessment

### Rare, Threatened, and Endangered Species

The Camel's Hump Management Unit is home to many rare and uncommon species of plants, and several rare and uncommon animals. These species and their management needs are summarized in the following text and tables.

#### PLANTS

Twenty-three species of rare or very rare plants have been located within the CHMU, as well as an additional three species of uncommon plants. Of the rare/very rare species, three are listed as "endangered" and another three are listed as "threatened" by Vermont state endangered species statute (10 V.S.A. 123). Their occurrence in the CHMU is thus very important on a statewide basis.

Fifteen of the rare or very rare plants occur on the summit of Camel's Hump, and several of these are dominant species in the Alpine Meadow natural community. Two are state-listed as legally protected: Boott's rattlesnake root (*Nabulus boottii*) and bearberry willow (*Salix uva-ursi*). Trampling by hikers (and dogs) poses a threat to all of the plant species found on and around the summit. The rattlesnake root is especially threatened as it occurs on both sides of the Long Trail as it approaches the summit from the north. Ongoing monitoring and management, as well as continued public outreach and education, are all necessary to maintain the viability of these plant populations. The Green Mountain Club's (GMC) Summit Caretaker program is likely largely responsible for the gradual spread of the rattlesnake root population and for the continued presence of the alpine tundra natural community on the summit. The north summit area will remain closed to hikers to allow the alpine vegetation to recover and respond to natural conditions rather than hiker and dog impacts.

Three additional state-listed plants occur on the ridge extending north of the summit. These species are: alpine sweet-grass (*Anthoxanthum monticola*), lesser pyrola (*Pyrola minor*), and squashberry (*Viburnum edule*). The lesser pyrola is one of only two populations extant in the state. This species and the squashberry are associated with a seepy area near the Long Trail; they will be identified and avoided during any trail work or other management activities. The alpine sweet-grass is known here only from historical records, and is associated with bedrock exposures. A search for this species will be conducted prior to any management activities that might impact suitable habitat.

The sixth state-listed species, Eastern Jacob's-ladder (*Polemonium van-bruntiae*), is found in a seepy old field within the Steven's Block of Camel's Hump State Forest. This species is considered globally uncommon; although its range extends from West Virginia to Maine and Quebec, it is listed as rare or uncommon in every state/province in which it occurs. It requires wet, generally seepy soils, and sunlight. At present, the best way to protect the population in the CHMU is to avoid direct impacts, and in particular, to avoid mowing the plants. It may also be necessary to monitor tree growth in the area around the plants, and to consider removing trees if canopy shade is having negative impacts on the population.

The remaining rare and uncommon plants of the CHMU are primarily found on cliffs or in small wetland natural communities scattered around the management unit. Maintaining the ecological integrity (and the hydrological integrity for wetlands) of these communities should allow the species to persist. A few species are found in Montane Spruce-Fir Forest; future trail projects or other management activities in that community will consider the possibility that these species may be present.

<b>Rare, Threatened, and Endangered Plants of the Camel's Hump Management Unit</b>					
<b>Species Name</b>	<b>Common Name</b>	<b>Sites Where Found</b>	<b>State Rarity Rank*</b>	<b>Rarity*</b>	<b>Legal Status</b>
<i>Nabalus bootii</i>	Boott's rattlesnake-root	Camel's Hump summit; cliffs	S1	Very Rare	Endangered
<i>Pyrola minor</i>	lesser pyrola	high-elevation seep	S1	Very Rare	Endangered
<i>Salix uva-ursi</i>	bearberry willow	Camel's Hump summit	S1	Very Rare	Endangered
<i>Anthoxanthum monticola</i>	alpine sweet-grass	high-elevation outcrops	S1	Very Rare	Threatened
<i>Viburnum edule</i>	Squashberry	high-elevation seep	S1	Very Rare	Threatened
<i>Polemonium vanbruntiae</i>	Eastern Jacob's ladder	seepy old field	S2	Rare	Threatened
<i>Agrostis mertensii</i>	boreal bentgrass	Camel's Hump Summit; hut clearing	S1	Very Rare	
<i>Carex bigelowii</i>	Bigelow's sedge	Camel's Hump summit	S1	Very Rare	
<i>Cystopteris laurentiana</i>	Laurentian bladder fern	Appalachian Gap cliffs	S1	Very Rare	
<i>Empetrum nigrum</i>	black crowberry	Camel's Hump summit	S1	Very Rare	
<i>Juncus trifidus</i>	highland rush	Camel's Hump summit; cliffs	S1	Very Rare	
<i>Minuartia groenlandica</i>	mountain sandwort	Camel's Hump summit	S1	Very Rare	

<i>Mylia taylorii</i>	A Liverwort	Camel's Hump summit	S1	Very Rare	
<i>Poa interior</i>	inland bluegrass	cliff & outcrop	S1	Very Rare	
<i>Solidago leiocarpa</i>	Cutler's goldenrod	Camel's Hump summit	S1	Very Rare	
<i>Trichomanes intricatum</i>	weft fern	Appalachian Gap cliffs	S1	Very Rare	
<i>Vaccinium boreale</i>	boreal blueberry	Camel's Hump summit	S1	Very Rare	
<i>Dryopteris fragrans</i>	fragrant fern	Ledges below summit	S2	Rare	
<i>Huperzia Appalachia</i>	mountain fir clubmoss	Camel's Hump summit	S2	Rare	
<i>Schistostega pennata</i>	luminous moss	montane forest	S2	Rare	
<i>Vaccinium uliginosum</i>	alpine bilberry	Camel's Hump summit	S2	Rare	
<i>Woodsia glabella</i>	smooth woodsia	Camel's Hump summit	S2	Rare	
<i>Solidago simplex</i> spp. <i>randii</i> var. <i>monticola</i>	Rand's mountain goldenrod	Camel's Hump summit	S2?	Apparently Rare	
<i>Galium kamtschaticum</i>	boreal bedstraw	seeps	S2S3	Uncommon to Rare	
<i>Luzula parviflora</i>	small-flowered rush	openings in montane forest	S2S3	Uncommon to Rare	
<i>Botrychium multifidum</i>	Leathery Grape-fern	montane forest	S3	Uncommon	
<i>Cryptogramma stelleri</i>	fragile rockbrake	cliffs	S3	Uncommon	
<i>Sorbus decora</i>	showy mountain ash	montane forest	S3	Uncommon	
*for a full explanation of these rarity ranks, visit the Vermont Natural Heritage Information Project website: <a href="http://www.vtfishandwildlife.com/wildlife_nongame.cfm">http://www.vtfishandwildlife.com/wildlife_nongame.cfm</a>					

## ANIMALS

Six species of very rare animals were documented at the CHMU, as well as four rare species and ten uncommon animals. Three of these animals are listed as species of concern in the state of Vermont, the Bicknell's thrush, the rock shrew, and the wood turtle. All of these species vary in their dependence on woodlands, wetlands, riparian areas, and high elevation habitats. Protecting the ecological integrity of these habitat types will likely protect these species as well.

Notably, wood turtle (*Glyptemys insculpta*) populations suffer from the commercial pet trade as individuals are harvested from the wild. This species nests in open sandy areas, and spends much of its time in and around slow-moving streams with sandy bottoms and over-hanging vegetation. They are considered vulnerable in every state and Canadian province in their range. Wood turtles have been documented in several towns associated with the CHMU including Huntington, Bolton, Duxbury, and Waitsfield, and are presumed present in Richmond (Andrews 2013). Management practices such as providing adequate riparian management zones (RMZs) and limiting tree removal at habitat sites during known nesting season will be implemented to protect this species.

Although the distribution of the Bicknell's thrush (*Catharus bicknelli*) in Vermont remains relatively stable (Rimmer 2010), it holds a status of vulnerable and declining by the International Union for Conservation of Nature (IUCN 2013). Monitoring, management, and conservation of its habitat are critical to the species continued presence in Vermont. Preferred and potential nesting sites have been mapped, and are monitored by the Mountain Birdwatch program based out of Vermont Center for Ecostudies. In addition, Vermont's strict land use laws provide opportunity for review of potential impacts on this species from high elevation projects such as wind towers and ski resorts. CHMU supports some relatively large areas of high elevation spruce/fir forest habitat conditions used for nesting by Bicknell's thrush and will be protected and monitored as part of this long-range management planning effort.

Other bird species that are ranked as very rare and occur within CHMU include: Philadelphia vireo (*Vireo philadelphicus*); Tennessee warbler (*Oreothlypis peregrine*); palm warbler (*Setophaga palmarum*); and Cape May warbler (*Setophaga tigrina*).

The Philadelphia vireo is at the southern edge of its range in Vermont and has seen declines in its population since the 1970s despite marked increases in nearby states (VBBA 2012). Future statewide targeted surveys may assist scientists and managers in determining the extent of the population decline. As a species that prefers early- to mid-successional forests, managing portions of the CHMU may help support this species in Vermont.

Both the Cape May and Tennessee warblers have also experienced decreases in their Vermont populations (VBBA 2012). As with the Philadelphia vireo, these species are at the southern edge of their range. Their occurrence in Vermont appears to parallel spruce budworm infestations which have potentially decreased due to lower availability of budworm habitat (VBBA 2012). No management

recommendations are currently warranted for either species; efforts for Tennessee warbler management are being directed at large-scale operations in other areas of its range.

The elusive long-tailed shrew (*Sorex dispar*) is rare in Vermont and is listed as a species of greatest conservation concern, but very little information is known about its population. This partially subterranean insectivore prefers higher elevations and cool, moist talus or rock where it forages (Merritt 1987). Restrictions on disturbance to high elevation cliffs with rocky slopes may avoid impacts to this species.

Two invertebrates with ranking of very rare, and very rare to rare were documented on the CHMU: the subarctic darner (*Aeshna subarctica*) and yellow-banded bumble bee (*Bombus terricola*), respectively. The darner is a northern latitude species that prefers bog or fen habitat and was identified in the Buel’s Gore region of the CHMU. These habitat types can easily be protected with adequate RMZs. Several individuals of the bumble bee were also located in Buel’s Gore as well as the summit of Camels Hump in montane yellow birch-red spruce forest (Richardson 2013). Recent efforts have been made to list the species as endangered in Vermont due to its population decline throughout its range. Continued conservation of alpine communities and sustained management of wildflower habitat are recommended management strategies for bumble bee conservation (Richardson 2013).

A number of other rare species in the CHMU may have gone undetected due to their elusive nature including some wetland and forest birds and mammals, as well as various invertebrates, fishes, and reptiles and amphibians.

Rare, Threatened, and Endangered Animals of the Camel’s Hump Management Unit				
BIRDS				
Species Name	Common Name	State Rarity Rank**	Rarity**	Status
<i>Catharus bicknelli</i>	Bicknell’s thrush	S2B*	Rare	Species of Concern
<u>Habitat:</u> dense, stunted stands of balsam fir and red spruce. <u>Threats:</u> loss of habitat				
<i>Vireo philadelphicus</i>	Philadelphia vireo	S1B	Very Rare	
<u>Habitat:</u> early to mid-successional forests and woodland edges. <u>Threats:</u> loss of early- to mid-successional habitat				
<i>Oreothylpis peregrine</i>	Tennessee warbler	S1B	Very Rare	
<u>Habitat:</u> coniferous forests or bogs with openings. <u>Threats:</u> reduction in large-scale logging, winter habitat loss				

<i>Setophaga palmarum</i>	palm warbler	S1B	Very Rare	
<u>Habitat:</u> bogs and fens, open forests and barrens. <u>Threats:</u> loss of habitat				
<i>Setophaga tigrina</i>	Cape May warbler	S1B	Very Rare	
<u>Habitat:</u> boreal coniferous forests. <u>Threats:</u> loss of habitat				
<i>Setophaga castanea</i>	bay-breasted warbler	S2B*	Rare	
<u>Habitat:</u> boreal forests. <u>Threats:</u> loss of habitat				
<i>Buteo lineatus</i>	red-shouldered hawk	S2B*	Rare	
<u>Habitat:</u> mature woods, riparian forests, extensive forest tracts with wetlands and ponds. <u>Threats:</u> loss of habitat				
<i>Corvus corax</i>	common raven	S3	Uncommon	
<u>Habitat:</u> mid- to high-elevation conifer and deciduous forests, cliffs and quarries. <u>Threats:</u> none identified				
<i>Botaurus lentiginosus</i>	American bittern	S3B*	Uncommon	
<u>Habitat:</u> Large wetlands with emergent vegetation, especially cattails. <u>Threats:</u> loss of habitat				
<i>Empidonax flaviventris</i>	yellow-bellied flycatcher	S3B	Uncommon	
<u>Habitat:</u> spruce or fir with mixed deciduous and dense understory. <u>Threats:</u> climate change and mountain top development				
<i>Polioptila caerulea</i>	blue-gray gnatcatcher	S3B	Uncommon	
<u>Habitat:</u> Riparian and lakeside deciduous forests and edges. <u>Threats:</u> none identified				
<i>Accipiter striatus</i>	Sharp-shinned Hawk	S3B, S3N	Uncommon	
<u>Habitat:</u> all forest types with conifer stands for nesting. <u>Threats:</u> impacts with windows and structures				
<i>Accipiter cooperii</i>	Cooper's hawk	S3B, S3N*	Uncommon	
<u>Habitat:</u> mature forest stands in semi-open country, tolerant of fragmentation. <u>Threats:</u> none identified				
<i>Aegolius acadicus</i>	Northern saw-whet owl	S3B, S3N	Uncommon	
<u>Habitat:</u> remote boreal and mixed forests with conifer swamps <u>Threats:</u> logging of mature forest stands				
<i>Bombycilla garrulous</i>	Bohemian waxwing	S3N	Uncommon	

<u>Habitat</u> : open coniferous or mixed forests, suburban areas with fruit <u>Threats</u> : none identified				
<b>MAMMALS</b>				
Species Name	Common Name	State Rarity Rank**	Rarity**	Status
<i>Sorex dispar</i>	long-tailed or rock shrew	S2*	Rare	Species of Concern
<u>Habitat</u> : high elevation, cold and damp coniferous stands with protective crevices. <u>Threats</u> : habitat loss due to climate change				
<b>REPTILES AND AMPHIBIANS</b>				
Species Name	Common Name	State Rarity Rank**	Rarity**	Legal Status
<i>Glyptemys insculpta</i>	wood turtle	S3*	Uncommon	Species of Concern
<u>Habitat</u> : slow-moving streams with sandy bottoms and overhanging vegetation. <u>Threats</u> : development, pollution and commercial collection.				
<b>INVERTEBRATES</b>				
Species Name	Common Name	State Rarity Rank**	Rarity**	Legal Status
<i>Aeshna subarctica</i>	subarctic damer	S1*	Very Rare	
<u>Habitat</u> : bogs and fens. <u>Threats</u> : pollution, wetland draining or development.				
<i>Bombus terricola</i>	yellow-banded bumble bee	S1S2	Very Rare to Rare	State Threatened
<u>Habitat</u> : areas of dense vegetation, milkweed and dogbane species; known to inhabit the Appalachian Gap area. <u>Threats</u> : Pests and diseases, habitat loss, pesticides, invasive species.				
<i>Somatochlora elongate</i>	ski-tipped emerald	S3*	Uncommon	
<u>Habitat</u> : small to medium sized streams with moderate flow and little emergent vegetation. <u>Threats</u> : pollution, development, and recreation.				
<i>Sympetrum danae</i>	saffron-winged meadowhawk	S3	Uncommon	
<u>Habitat</u> : bogs, marshy ponds and lakes. <u>Threats</u> : wetland drainage, development, and pollution.				
*Species of Greatest Conservation Need as identified in the Vermont Wildlife Action Plan; does not denote legal protection.				
**for a full explanation of these rarity rankings, visit the Vermont Natural Heritage Information Project website: <a href="http://www.vtfishandwildlife.com/wildlife_nongame.cfm">http://www.vtfishandwildlife.com/wildlife_nongame.cfm</a> .				

## C. Wildlife and Habitat Assessment

### Habitats

The CHMU provides a myriad of habitats for a wide variety of wildlife. The large size and extensive distribution of the unfragmented forest habitat that make up the CHMU are perhaps the most significant wildlife habitat value in that the lands provide a large area for many types of wildlife to live, reproduce and move throughout a wide area. Habitat conditions within CHMU range widely from high elevation spruce/fir krummholz used by several rare songbirds, and remote wetlands used by waterfowl, beaver, otter and moose, to concentrated areas of American beech, red oak, mountain ash, apple, and other mast producing trees used as important feeding areas by black bear and many other wildlife, to name a few.

The following information provides a summary and overview of the various wildlife habitat conditions within CHMU based on recent and historic inventories and assessments.

### WETLANDS

Of the 26,275 acres comprising the CHMU, approximately 182 acres (0.7%) have been identified as wetlands. Although somewhat limited in abundance, these wetlands provide significant habitat for species that rely on them for all or part of their life cycle requirements. For instance, moose are often observed feeding in some of the remote beaver influenced wetlands. Black bears use forested wetlands and seeps as feeding sites, particularly during the spring as sedges and other early emerging vegetation appears.

Forested swamps and seeps comprise the majority of this acreage and support a variety of breeding songbirds as well as a number of amphibians. In some cases, wood ducks (*Aix sponsa*) are supported when swamps are associated with streams and lakes. Softwood swamps may also serve as wintering grounds for white-tailed deer (*Odocoileus virginianus*). Isolated seeps serve as feeding sites for black bears (*Ursus americanus*) emerging from hibernation. In the case of CHMU, many of these forested wetland habitats provide some or all of these functions.

Approximately 54 acres of the CHMU are comprised of beaver (*Castor canadensis*) influenced wetlands. Beaver influence on the landscape is dramatic, particularly in forest-dominated regions where few openings exist. As beaver cut trees to dam water and build lodges, large openings are created. Over time, they consume all available food sources and abandon their engineered wetlands for other suitable locations. Neglected dams eventually collapse and the wetland is drained, resulting in mudflats and the succession of vegetation back to woody stems. Beavers may return to an old site, thereby commencing the cycle over again. Assuming water sources are available and current beaver populations continue to reproduce successfully, it is possible that the number and acreage of beaver wetlands will increase in the CHMU. These wetland habitats that occur on CHMU are considered highly significant for their wildlife habitat functions as they provide an open water wetland condition that is not found in other habitat conditions on the property. These areas on CHMU are used by, and important for, a wide array

of wildlife including waterfowl, wading birds, shore birds, songbirds, raptors, mink, otter, muskrat, beaver, white-tailed deer, moose, black bear and more.

#### STREAMS and RIPARIAN HABITAT

Approximately 100 miles of streams drain or border the CHMU. Many species of wildlife rely on riparian areas for a variety of life-stage requirements. Many amphibians and reptiles nest and forage in and along streams. Of particular note is the wood turtle which has been documented within the CHMU. This species overwinters in streams and may travel up to 1000 feet from aquatic habitat for nesting and feeding activity (VTANR 2005). Additionally, northern two-lined salamanders (*Eurycea bislineata*) and spring salamanders (*Gyrinophilus porphyriticus*) breed in woodland and shaded streams within CHMU.

A number of migratory birds also spend their breeding period in riparian habitat, including waterfowl. The types of birds supported depend on the width of the riparian management zone (RMZ) – a wider RMZ tends to support more species (VTANR 2005).

Wide-ranging mammals use riparian areas to travel between habitats within their range. A black bear study in Vermont highlighted the importance of riparian corridors for movement across the landscape (Hammond 2002). Moving from one feeding or breeding area to another is critical to maintaining populations and their genetic diversity. This is particularly apparent when examining the potential for black bears to move across roads within the CHMU and beyond to areas such as Mount Mansfield State Forest. Areas of habitat connectivity within this region align in some cases with riparian habitats.

The *Riparian Management Guidelines for Agency of Natural Resources Lands* and Acceptable Management Practices (AMPs) will be followed when management practices occur near riparian habitat. The width of the RMZ will be determined based on criteria within the guidelines. While timber harvesting within the RMZ can be managed based on time of operations, proximity to the stream, and other factors, it is important to avoid developing roads, trails or other permanent infrastructure across or in close proximity to these sensitive habitats.

#### WINTER HABITAT for WHITE-TAILED DEER and MOOSE

White-tailed deer and moose have evolved and adapted to survive in northern environments by relying on specific habitat features known as winter habitat, wintering areas, or, in the case of deer, deer wintering area. These areas are comprised of varying age classes of softwood cover (spruce, fir, hemlock, cedar, white pine) that create a canopy resulting in reduced snow depths and higher mean daily temperatures during the winter months. This habitat is essential for the survival of these species in Vermont and throughout the northern part of their range.

There are six areas of deer winter habitat totaling approximately 448 acres documented on the CHMU, based on recent and historic field assessments. This represents a very limited area of the overall 26,275 acre CHMU and as such, will be carefully maintained. Wintering areas will be assessed and management will follow the *Management Guide for Deer Wintering Areas in Vermont* (VDFPR and VDFW 1990) which emphasizes the implementation of area regulation for treatments in a variety of softwood cover types.

Moose winter habitat has not been inventoried on CHMU, however, moose are not as selective in their winter habitat preferences as deer and it is likely that any mature softwood cover above 2000 feet in elevation may support wintering moose.

#### MAST STANDS

Over 15,000 acres of the CHMU is comprised of northern hardwood forest formations of which American beech (*Fagus grandifolia*) is a large component. An additional 56 acres is comprised of red oak (*Quercus rubra*), although red oak is distributed in various regions of the CHMU. Acorns and beechnuts provide essential fats and nutrients to black bear as they prepare for winter hibernation, as well as wild turkey, white-tailed deer, and a host of small mammals and birds. Statewide beechnut productivity is monitored on an annual basis as a long-term measure of cub survival.

Based on historic and recent habitat assessments, there are fourteen areas of Beech Mast Production Areas (BMPAs) that have been identified and mapped on the CHMU. Recent field assessments of these BMPAs have shown that they comprise 314 acres in total. They range in size from 1 acre to over 160 acres. BMPAs are widely distributed throughout the CHMU. The two largest BMPAs are located within the Phen Basin block of the CHMU and as such are considered highly important for the conservation and management of the area.

#### VERNAL POOLS

Vernal pools are important wetland habitats for a variety of wildlife, and in particular as breeding habitat for certain amphibians such as yellow-spotted salamanders, wood frogs, and spring peepers. They are also used by other wildlife as areas to find food and water.

Potential vernal pools have been remotely identified statewide in an effort to accurately map them for conservation planning efforts by a team from the Vermont Center for Ecostudies (Faccio et al. 2013). Based on this mapping effort, six vernal pools have been confirmed within the management unit, while sixteen potential pools require site visits or additional information for verification. One pool directly adjacent to the management unit boundary remains unconfirmed.

#### GRASSLANDS

Approximately 100 acres of the CHMU are open fields which are generally scattered openings throughout the forest landscape. Three reports of grassland birds were made – one of a savannah sparrow (*Passerculus sandwichensis*) and two of bobolink (*Dolichonyx oryzivorus*) – at the CHMU. The savannah sparrow was noted on Duxbury Road and may have been breeding in adjacent agricultural fields which are common in the Winooski River valley. Interestingly, the bobolink sightings were at the Appalachian Gap and in the Honey Hollow region of the CHMU. However, it is unlikely that the open fields associated with the CHMU are large enough to support a breeding population of these grassland birds or others such as upland sandpiper (*Bartramia longicauda*), grasshopper sparrow (*Ammodramous savannarum*), and eastern meadowlark (*Sturnella magna*). Nonetheless, continued management of the open fields is likely to support foraging, bedding, or birthing habitat for white-tailed deer, and hunting sites for red fox (*Vulpes vulpes*) or burrow sites for woodchuck (*Marmota monax*).

## RAPTOR NESTING TREES

Six species of raptors were documented within the CHMU (eBird 2012). Trees that host viable raptor nests are generally preferred sites for repeated breeding success. Inventories of these sites will be completed during forest stand inventory, as well as during planning and implementation of management activities. These surveys will be a routine part of preparing for timber harvest or other activities within the CHMU.

### SUMMARY OF WILDLIFE HABITATS WITHIN THE CHMU

HABITAT	APPROXIMATE ACREAGE	SOME ASSOCIATED WILDLIFE
Northern Hardwood Forest	14,600	white-tailed deer, black bear, moose, chipmunk, porcupine, red squirrel, many birds species, reptiles, amphibians
Montane Yellow Birch-Red Spruce Forest	4,300	moose, many species of birds
Montane Spruce-Fir Forest	4,000	blackpoll warbler, yellow-rumped warbler, Bicknell's thrush, other bird species
Hemlock-Northern Harwood Forest	1100	white-tailed deer, ruffed grouse, black bear, squirrels, many bird species, moose
Other Softwood Forest	300	white-tailed deer, squirrels, pileated woodpecker, barred owl, turkey, black bear
Red Spruce-Northern Hardwood Forest	700	moose, black bear, many bird species, white-tailed deer
Red Spruce-Heath Rocky Ridge Forest	500	black bears, many species of birds
Open Fields	100	white-tailed deer, fox, woodchuck, small mammals, many bird species
Boreal/Alpine/Krummholz Communities	90	deer mice, red-backed voles, meadow voles, northern juncos, snowshoe hare, rock shrew
Red Oak-Northern Hardwood Forest	60	northern flying squirrel, pileated woodpecker, barred owl, turkey, black bear, white-tailed deer
Seeps/Vernal Pools	70	black bear, white-tailed deer, amphibians

Beaver Wetland/Swamps	50	beaver, moose, bats, many birds, amphibians, and small mammals, various fish, invertebrates
Silver Maple-Ostrich Fern Riverine Floodplain Forest	40	many species of birds, otter, mink, muskrat, beaver, many species of amphibians
Cliffs/Rock Outcrops	35	raven, northern junco, small mammals, rock shrew, bobcat, many bird species

## Wildlife

### BIRDS

Observations of breeding and migratory birds were extracted from the eBird listserv where birders can submit their sightings. Only entries vetted by professional biologists were used in this plan. Records date as far back as 2009. Of the nearly 117 species observed, eight are state-ranked as uncommon and six as rare or very rare. None are listed as state or federally threatened or endangered. Five of the State-ranked species were noted as a species of greatest conservation need (SGCN) and thus are part of Vermont's Wildlife Action Plan.

A breeding denizen of high-elevation montane spruce-fir forests, the Bicknell's thrush was observed on several occasions. This species is ranked as rare in Vermont and maintains status as a species of concern, which does not denote legal protection. However, development above 2500' elevation is regulated under Vermont's land use policies.

Two non-native species were identified at CHMU: rock dove (*Columba livia*), and the house sparrow (*Passer domesticus*). The house sparrow observation was made in the Honey Hollow block, likely adjacent to human structures or feeders. A single rock dove sighting was made at the summit. Neither of these species is likely to cause any significant impacts to native breeding bird populations within the CHMU.

### AMPHIBIANS AND REPTILES

Twenty-one species out of 33 reptiles and amphibians known to occur in Vermont have been documented within the management unit including seven frogs, six salamanders, five snakes, and three turtles. Records were acquired from the Vermont Amphibian and Reptile Atlas database and include both systematic and incidental observations. A single uncommon species was observed – the wood turtle. The wood turtle is also listed as a Species of Concern in Vermont and identified as SGCN in the Wildlife Action Plan. Reptiles that are commonly found within CHMU include garter snake, green snake, and painted turtle. Amphibians that are commonly found within CHMU include red-backed salamander, green frog, wood frog, bull frog, American toad, spring peeper, yellow-spotted salamander.

### BATS

Vermont is home to nine bat species, five of which are listed as threatened or endangered due in large part to the emergence of white nose syndrome. They include the federal- and state-endangered Indiana bat (*Myotis sodalist*), the state-endangered little brown bat (*Myotis lucifugus*), and tri-colored bat (*Perimyotis subflavus*), the state-threatened eastern small-footed bat (*Myotis leibii*), and the state-endangered and federal-threatened northern long-eared bat (*Myotis septentrionalis*).

Although bat surveys have not been conducted within the CHMU, surveys conducted at nearby locations (all within eight miles of CHMU in the towns of Starksboro, Jericho, and Moretown) show the presence of reproductive little brown, big brown (*Eptesicus fuscus*), and northern long-eared bats as well as Indiana and tri-colored bats. Small-footed bats are also suspected to be present based on the availability of preferred cliff habitat (approximately 35 acres). All three species of migratory tree bats are widespread in Vermont and assumed to be present in the area. A nearby mine hosts a hibernating colony of little brown, big brown, northern long-eared, and tri-colored bats.

#### DEER AND MOOSE

Moose are the largest member of the deer family (cervidae), and also Vermont's largest mammal, weighing up to 1400 pounds and standing up to a height of 6.5 feet tall at the shoulder. In Vermont, moose are typically found in the northeast boreal forests and the spine of the Green Mountains where large stretches of habitat are available. They frequent ponds for feeding and cooling during hot summer months when they also seek shaded lowland softwood stands. Clearcuts are used throughout and hardwoods located near softwood cover are preferred in the fall where more winter food-types are usually available. Softwood shelter is preferred when snow depths reach 35 inches, a crust develops over the snow, or when conditions are extremely cold or windy. Well adapted for cold temperatures, moose often winter at higher elevations.

The CHMU provides a large area of contiguous forest habitat that is important to support a strong moose population as well as movement across the landscape. Since the implementation of the regulated moose hunt in 1993, ten moose have been harvested from the CHMU. Evidence of moose has been observed throughout the CHMU. Scattered clearcuts combined with perpetuation of softwood stands as wintering habitat are important management strategies for moose. A combination of even-age and uneven-age forest management while maintaining the overall forest health and connectivity within the entire CHMU is the best guide for moose habitat management and will serve the needs and interests of many other wildlife that use the area.

White-tailed deer are one of the more common species of mammals found throughout the state. Evidence of deer throughout the CHMU is abundant, including tracks, browse, beds, and rubs. It is unknown how many deer have been harvested from the CHMU, but the entire parcel is open to hunting and provides high quality habitat for this species throughout the year. Nonetheless, deer density at higher elevations is lower than in lowland areas where fields and forests are interspersed and a greater diversity and quality of food sources is available (VDFW 2010). Deer wintering habitat, characterized by softwood stands with typically southward aspect, are limited at the CHMU. Much of the CHMU is mid- and upper elevation land and as such provides suitable spring, summer and fall habitat for deer. Deer winter habitat is fairly limited, however, on the management unit, largely due to the elevation of much

of the property. It does support six important areas of deer winter habitat distributed throughout the state land, and is adjacent to larger areas of deer winter habitat on adjoining private land. These seven deer wintering areas cover approximately 448 acres.

#### BLACK BEAR

Although rarely seen, black bears are common within CHMU and rely on the extensive, remote forest habitats and abundance of food resources. As noted above, beech mast stands are important bear feeding habitat in the fall. Also important is wetland habitat in early spring, when bears can be dependent on the early fresh growth of herbs and sedges found in wetlands.

In recent years, black bears have become an occasional nuisance at several campsites in the CHMU including Hump Brook Tenting Area and Montclair Glen Lodge. These are both very popular campsites and bears are attracted to food scents. Secure food storage boxes were installed at several campsites in 2015 by the Green Mountain Club.

#### RUFFED GROUSE AND AMERICAN WOODCOCK

Both ruffed grouse (*Bonasa umbellus*) and American woodcock (*Scolopax minor*) are closely associated with early successional habitat and have been documented on the CHMU. Grouse prefer areas of approximately 40 acres or more comprised of three age classes (0-10, 10-25, and 25+ years) of aspen and white birch. Grassy openings, apple trees, and patches of softwood forest also contribute to their habitat needs. Grouse have been documented on the CHMU, however, forest age classes and species compositions vary greatly. Further assessment is necessary to determine the extent of current and potential habitat availability through natural occurrences and management strategies. However, there is currently only limited young forest habitat conditions within the CHMU.

American woodcock habitat typically contains young speckled alder or gray dogwood, as well as abandoned brushy fields and open fields for courtship displays, feeding, nesting, and brood-rearing. Approximately 100 acres of the CHMU is open fields. Management practices have been implemented in portions of the CHMU including Robbins Mountain WMA to enhance woodcock and grouse habitat. Habitat that supports these game species also supports a wide range of non-game species such as chestnut-sided warbler, rufous-sided towhee, yellow warbler, and provides feeding areas for raptors due to the abundant small mammal populations that these areas of young forest support.

#### WILD TURKEY

Due to their high mobility, wild turkeys (*Meleagris gallopavo*) exploit a wide array of forest types. High quality turkey habitat includes varying forest types and age classes dominated by mast-producing species such as oak and beech. Open understory, interspersed clearings, groups of conifers, large open grown trees bordering fields for roosting and cultivated land are also important features for turkeys. Dense cover for nest-concealment, grassy clearing for brood-rearing, and winter food sources such as sensitive fern or burdock, complete the mosaic of habitats utilized by this species.

#### FURBEARERS

Habitat elements at the CHMU are such that a variety of furbearer populations are supported including: beaver, eastern coyote (*Canis latrans*), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*),

fisher (*Martes pennant*), mink (*Neovion vison*), and bobcat (*Lynx rufus*). Mink are members of the weasel family and are aggressive carnivores preying primarily on fish, but also on muskrats and waterfowl. They are associated with marshes, and will take advantage of streams while favoring any forested wetlands available in the CHMU. Due to their diet, mink are susceptible to toxin accumulation in a watershed, thus making water quality an important habitat concern.

Coyote, fox, fisher, and bobcat are more wide-ranging species that use the CHMU to meet habitat needs as part of their range.

### **Other Important Habitat Features**

#### Contiguous Forest Habitat

Contiguous forest refers to forested areas that are relatively large and unfragmented by development or agriculture. Contiguous or unfragmented forest provides important habitat functions that serve to buffer many species of wildlife from the deleterious effects of roads, residential and commercial development, agriculture, and other human-related disturbances. The large, unfragmented areas of forest habitat provide critical nesting habitat for forest-interior songbirds such as the hermit thrush (state bird), scarlet tanager, and black-throated blue warbler, among others. CHMU is considered a significant unfragmented forest habitat.

Almost all of the CHMU is considered contiguous forest, with the exception of areas along roads. However, the vast majority of the management unit is within two different blocks of contiguous forest, separated by Route 17. The block to the north of Route 17 extends all the way up to the Winooski Valley, and is bounded by the Mad River Valley to the east and the Huntington River valley to the west. Covering over 57,000 acres of both public and privately-owned land, it is among the largest blocks of core forest in the state. The block to the south of Route 17 is not quite so notable, but still covers an impressive 21,000 acres extending down to the Lincoln Gap Road, bounded roughly by Route 100 to the east and the base of the mountain ridge to the west. Both these blocks provide important habitat for many species. Although visitors to the Howe Block of Camel's Hump State Forest may feel isolated, the Howe Block is within a relatively small habitat block of only about 3,000 acres. This block is bounded by Routes 100, and 17, German Flats Road, and the Sugarbush Access Road. Marble Hill Road and Tucker Hill Road, as well as some smaller roads and house lots and a powerline corridor contribute to some further fragmentation of this habitat. The most remote forested habitat within this block is in the center of the Howe Block parcel, making this land an important local refuge for species that prefer core forest.

#### Wildlife Movement Corridors

Connections between habitat blocks or other discrete habitat features serve an important function in maintaining the long-term health and viability of wildlife populations. Wildlife corridors not only allow individual animals (such as dispersing young searching for new home ranges) to move throughout the landscape, but also allow for the transfer of genetic information across the region. Even the occasional movement of a few individual animals between otherwise isolated populations can substantially increase the long-term viability of each, because the genetic diversity within each group is effectively increased.

As noted above, the CHMU is almost entirely without internal fragmentation, providing ample movement opportunities for wildlife that will travel through high-elevation hardwood forests and spruce-fir forests. Riparian and low-elevation travel corridors are limited within the management unit, although the larger streams (e.g. Preston Brook, Gleason Brook, Cobb Brook, etc.) provide localized riparian corridors. Wildlife road crossing data indicate that the most frequent observations of wildlife movement are along Interstate 89, with limited observations along the other roads bounding the unit (primarily Routes 100 and 17). At the landscape level, a model for wildlife corridors developed by the Vermont Fish and Wildlife Department (Sorenson and Osborne 2010) indicates that the CHMU is of very high value for a north-south movement. Protecting or even enhancing connections between the CHMU and surrounding wild lands will help preserve the long-term viability of many species.

While the Howe Block is not in itself part of a large habitat block, it offers good connectivity to the large, unfragmented areas of the Green Mountains, with narrow German Flats Road as the primary barrier between the Green Mountain spine and the Howe Block. Although CHMU is more fragmented within the Mad River valley, black bear and other wildlife are still able to use vegetated corridors to cross Route 100 and other town roads. At a local scale, the forest surrounding the Howe Block offers wildlife access directly down to the Mad River, providing opportunities for species to travel from core forest directly down to a major river.

Future management within the CHMU should remain focused on maintaining connectivity of the larger suite of forest habitat blocks in the region. This involves avoiding development of new roads, trails or other infrastructure within those connectivity areas.

#### Snags, Den Trees, and Downed, Dead Wood

Standing and dying trees and downed, dead trees are vital components of the forest structure that provide food and shelter for wildlife ranging from mammals to invertebrates. With the declining statewide bat population, dead and dying trees could play a critical role in preventing further collapse of threatened and endangered species. More common species also depend on these features, and a full range of wildlife species is best accommodated by variation in size, species, location, aspect, and condition of tree and wood. Forest inventory methods incorporate data collection on frequency of snags and den trees. The presence of these features are an important consideration when creating silvicultural prescriptions.



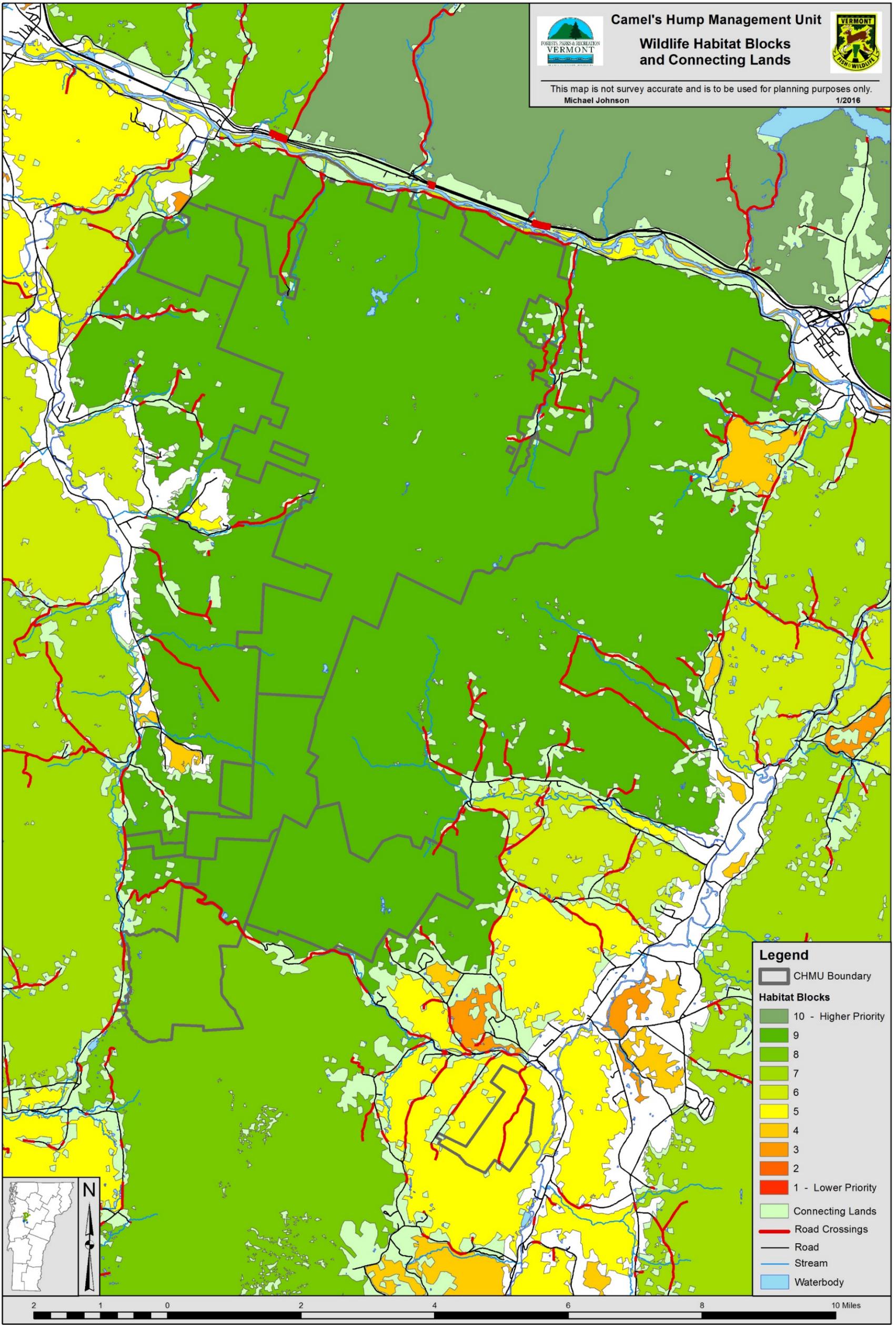


Figure 11- Wildlife Habitat Block and Connecting Lands Map

## D. Timber Resource Assessment

While the majority of forest products in Vermont are derived from private lands, state lands such as the CHMU are a locally important part of the wood products sector and are capable of growing some very high-quality timber. The management of timber on the CHMU focuses on silvicultural methods for exemplary forest management, longer rotations, and demonstrations that can be used or adapted to private lands.

During the last management cycle, spanning the period between 1991 and 2015, there have been eighteen separate commercial timber harvests treating approximately 1745 acres. Total revenue for these timber harvests exceeds \$2 million (in inflation adjusted 2014 dollars). Total volume exceeds 4.5 million board feet of sawtimber and 7,700 cords of pulp and firewood. Most of the treatments have been geared toward transitioning over-stocked 2-aged and even aged stands toward a more uneven-aged condition. In all, 1527 acres of forest have been treated with single-tree and group selection harvests since 1991. In addition, 48 acres of softwood plantation have been thinned, and 73 acres have experienced an overstory removal treatment to release established softwood regeneration. Finally, approximately 97 acres of young forest have been created through the use of patch cuts.

While it is helpful to reference revenue and volume figures when evaluating the extent of past timber management, it is important to recognize that forest stands on the CHMU are managed for a range of reasons including improved forest health and forest structure, better tree vigor and quality, improved wildlife habitats, demonstration projects, and providing high quality forest products to society. This management is undertaken utilizing sustainable forest management methods, and abiding by the State's Acceptable Management Practices (AMPs) for Maintaining Water Quality on Logging Jobs in Vermont, *The Riparian Management Guidelines for Agency of Natural Resources Lands*, and all other laws and regulations pertaining to logging operations in Vermont. Sustainable forestry is the production and use of resources to meet the needs of present generations without compromising the ability to meet the needs of future generations.

The vast majority of the forests of the CHMU available for timber production are second growth hardwoods. Most of these lands were heavily harvested in the mid to late 1800's, into the early 1900's. Much of the land acquired for the CHMU was logged quite extensively prior to state ownership.

Of the 26,275 acres of the CHMU, approximately 8,500 acres are suitable, and available for timber management. Subtracted from the total land base acreage are the timber reserved land, natural area, brooks, rivers, wetlands, seeps, vernal pools and associated Riparian Management Zones (RMZs), cliffs, exceedingly steep, rocky, and inaccessible areas, intensively used recreational areas, easement restricted lands, and agricultural lands.

In preparation for completing the LRMP for the unit, a timber assessment was conducted. A traditional timber assessment might have included "cruising" every forest stand on the property, a daunting task for a parcel of this size. Instead, utilizing existing inventory data, GIS data layers, and local knowledge, a timber cruise was conducted on a subset of forest stands, focusing on those areas that are accessible to timber management from both a physical and site perspective as well as a regulatory perspective. This forest inventory data was used to create a timber harvesting schedule (see section IV.D). Forest inventory data and maps can be found in Appendix H.

**ACREAGES OF TIMBER AND NON-TIMBER LANDS ON THE CHMU**

LAND CATEGORY	APPROXIMATE ACREAGE	COMMENTS
Timber growing land	8,500	
Rocky/Too Steep/Inaccessible	6,500	Does not include land above 2500'
Easement/Legislatively restricted	6,400	Most of Phen Basin Block and Gleason Block and upper elev. (does not include natural area)
Natural Area	1,700	Lands above 2800' elevation
Timber reserved	1,500	Most of Huntington Gap WMA
Water features and RMZs	1,500	
Agricultural land/fields/openings	100	
Intensive recreation use land	50	Does not include upper elevation areas above 2500' elev.

TIMBER TYPE	APPROXIMATE ACREAGE (Timber Growing Land)	APPROXIMATE %
Northern Hardwood	5,500	65
Mixed Hardwood/Softwood	1,600	19
White Birch	770	9
Softwood	330	4
Pioneer	230	3
Oak/Hardwood	70	<1

## E. Water and Fisheries Assessment

The Camel's Hump Management Unit is within the Winooski River watershed, which drains to the Lake Champlain Basin. The nearly 100 miles of rivers and streams in the CHMU drain either east towards the Mad River or west to the Huntington River. A smaller section drains north directly to the Winooski River where it has about 1¾ miles of frontage, including parts of the river corridor<sup>2</sup>. Beaver ponds, seeps and vernal pools make up the rest of the water bodies. The water resources are protected by the predominately forested landscape and limited conflicts with human infrastructure.

Most of the streams are the head waters of steep gradient streams that have good to excellent water quality. These forested headwater streams are the defining water feature of the unit. Riparian area forests, adjacent to water bodies, are complex ecosystems vital to the protection of headwater streams, as well as ponds, seeps, wetlands, and vernal pools. Riparian forests function as sources of food for wildlife, and are transformers of nutrients and are nutrient sinks. They also hold back storm runoff to reduce erosion.

As these streams feed into larger streams, they are in turn able to provide protection to both the water quality, habitat and overall condition downstream. Although still in good condition, streams lower down in the watershed do experience some impairment or alteration: Both the Mad and the Huntington Rivers have impaired sections due to excessive *bacteria*. Both rivers are also subject to high sediment loads, both from land erosion and channel erosion as the streams work towards a state of equilibrium. Roads within the mountainous landscape as well as agricultural land use are significant sources of sediment. The Winooski River basin as a whole carries significant phosphorus and sediment loads to Lake Champlain. The ANR Winooski River Basin Plan (2012) focuses on these pollutants through implementation of best management practices.

The State collects limited water quality data for headwater streams, but instead assumes that a predominantly forested watershed will result in very good to excellent water quality. More data for downstream areas does exist and can help direct management of the CHMU towards supporting the downstream health of the stream. Information more specific to the tributaries within and downstream of the CHMU boundaries follow:

### Mad River Watershed

At the southern end of the CHMU, the Stark Mountains drain east to the Shepard and Mill Brooks. Based on water quality data<sup>3</sup> collected below the CHMU boundary, both brooks rate very good to excellent; however, on Mill Brook hydrology is altered at river mile 2.1, due to water withdrawal from snowmaking at Mad River. Both streams provide habitat for wild brook trout as well as rainbow and brown.

As small area of Camels Hump State Forest at Dana Hill Road drains to the Mad River.

### Huntington River Watershed

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<sup>2</sup> River Corridors identify the area that the stream or river needs to maintain physical / geomorphic equilibrium. These dynamic areas are also where a great deal of damage occurs during flooding disasters.

<sup>3</sup> All data associated with water quality can be found at the DEC Watershed Data Portal, <http://anrintra.vt.gov/DEC/WDP/>

The CHMU's western slope of the Stark Mountains drains directly to the Huntington River and includes 2 miles of the river corridor.

Heading north, the CHMU encompasses the headwaters of Jones, Cobb and Brush Brooks on the western flanks of the Green Mountain. Below the CHMU boundary, these streams run through an agricultural landscape with steep unpaved roads. The *E. coli* levels on Brush Brook, measured by the Friends of the Huntington River, can be high during rain events.

#### Winooski River Direct

Unlike the previously described streams, the CHMU covers a significant portion of the streams and their watersheds on the north side of the unit. These steep gradient streams, Ridley, Gleason and Preston Brooks, are predominantly forested and drain directly to the Winooski.

The eastern most stream, Ridley Brook, is confined by Camel's Hump road and associated driveways as well as a steep valley walls. The runoff from tropical storm Irene in 2011, resulted in substantial movement of Ridley Brook, damaging roads and bridges. Subsequent work to increase culvert sizes have helped to reduce future conflicts with infrastructure as well as protect aquatic organism passage. The water quality of Ridley Brook is rated very good to excellent based on 2010 results at river mile 1.7.

Further west is Gleason followed by Preston Brook. The headwaters of Gleason Brook are not confined by roads. Preston Brook follows the Honey Hollow Road. At the mouth of Preston Brook, significant sediment load has been dropped due to the stream's erosional processes. Conflicts with the road as well as a berm on state land both results in an energized stream, causing deepening of the channel and subsequent bank failures. The existing mature trees on the berm also provide some stability to the stream, making idea of its removal less beneficial.

#### Ponds and Wetlands

Other than beaver ponds, there are no major water bodies within the CHMU, although a small section of the Gillette Pond watershed is contained on the northwest corner of the CHMU.

The beaver ponds cover approximately 54 acres of the CHMU. These ponds are typically remote and at mid to upper elevations. Ponds are located at the headwaters of Ridley and Hump Brooks in North Duxbury, Cobb Brook in Huntington, Beaver Meadow Brook in Buel's Gore, Mill and French Brooks within the Phen Basin Block in Fayston, near the Huntington River on the Stevens Block, with the largest complex located on a bench on the west side of the Camel's Hump ridge in the headwaters of Gleason Brook. All told there are about fifteen beaver maintained ponds within the CHMU, ranging in size from less than an acre to about 2 ½ acres. These ponds fluctuate over time with the ebb and flow of active beaver colonies. Wetland complexes commonly associated with these beaver ponds provide significant ecological functions and values including water quality filtration, vital habitat for a wide range of plants and animals, and enjoyment by visitors.

Small patch wetlands also exist, occurring in both closed basins and as a result of groundwater seepage. Groundwater flow can result in open seeps and seepage swamp communities, which have a specially adapted flora component. In addition, numerous Vernal Pools are found throughout the management unit, providing important amphibian breeding habitat. These small wetlands are easily impacted by

changes in hydrology or canopy cover. Please refer to the **Natural Communities of the Camel’s Hump Management Unit table on page 27 for additional descriptions** and the [ANR Environmental Atlas](#).

Fisheries

Brook trout is the dominant salmonid species within the CHMU, while rainbow and brown trout inhabit some of the lower elevations of brooks near the Winooski and Huntington Rivers.

Below is a listing of fish species associated with the various water features within the Camel’s Hump Management Unit.

WATER FEATURE	FISH SPECIES
Winooski River	brown and rainbow trout, landlocked Atlantic salmon, rock and smallmouth bass, fall fish, creek chub, white sucker, walleye, black nosed dace, common shiner, and other species of minnows
Huntington River	brook, brown, and rainbow trout, landlocked Atlantic salmon, fall fish, creek chub, white sucker, black nosed dace, common shiner, and other species of minnows
Brooks	brook, rainbow, and brown trout, slimy sculpin, black nosed dace, long nosed dace
Beaver Ponds	brook trout, northern red bellied dace, creek chub, black nosed dace

Management Considerations

The forests associated with the headwater streams found on the CHMU are complex ecosystems vital to the protection of headwater streams, as well as ponds, seeps, wetlands, and vernal pools. Riparian forests remove pollutants and reduce erosion. They function as sources of food for wildlife, and are transformers of nutrients and are nutrient sinks. Riparian area size depends on soils, slope, forest cover type, and type of water feature. To protect these features, it is important to maintain minimum levels of shade provided by the forest canopy. The *Riparian Management Guidelines for Agency of Natural Resources Lands* call for limited cutting in the Riparian Management Zones and a focus on managing for continued and enhanced riparian function.

Headwater streams are prone to rapid changes in water-flow conditions in response to precipitation events. Climate change models predict more intensive precipitation events in the future, and qualitatively, managers have already seen the impact of more frequent heavy storm events in the CHMU. In each summer of 2011, 2013, and 2015, the area was hit by one, or a series of heavy storms that caused streams to overflow their banks leading to damage of road infrastructure- plugged and dislodged culverts, washed out bridge abutments, washed out roads, etc.

Coupled with these headwater streams that are prone to high flows, is the fact that portions of the CHMU have “legacy” skid roads and undersized culverts that are not built to proper standards. In response to the storm events of the past decade, ANR land managers have embraced the lens of “Flood Resilience” when planning activities in the forest. The importance of properly sizing culverts, bridges, and constructing roads outside of riparian areas is growing more and more obvious every year.

In 2014, FPR replaced a 6-foot culvert in Honey Hollow that had been washed out twice in three years with a 40-foot truck bridge. Additionally, 5-foot double culverts were replaced in Duxbury with a 30-foot bridge. ANR will continue to make necessary improvements to undersized stream crossing infrastructure as funding allows.

The health and quality of the water features found on the CHMU are a highly important aspect of management of the CHMU. Very strong consideration will be taken in all activities undertaken on the CHMU to ensure a continuing priority to water quality.

## **F. Forest Health Assessment**

### **1. General Forest Health:**

#### *History of CHMU Forest Health Issues*

Historically, abiotic factors including weather and climate, have played a more significant role in impacting forest health in the CHMU than biotic factors such as insects and diseases. However, like forests themselves, forest health conditions are complicated and influenced not only by individual biotic or abiotic factors, but the combination of weather, climate, insects, and disease.

The present-day forest composition of the CHMU- particularly the paper birch at the mid and upper elevations- owes much to large fires that burned many thousands of acres in 1903 and 1908. However, it is important to note that conditions in 1903 and 1908 were uniquely suited to large fires, and very different conditions prevail in the present day. Since then forest fires have been very small and rare on the CHMU.

Acid rain has had a significant and well documented impact on forest health in the CHMU. In fact, some early groundbreaking research tying acid rain to declines in forest health was conducted on the western side of Camel’s Hump. During the height of the acid rain crisis, high elevation spruce and fir trees were dying at a rapid rate. In the past 30 years, the scourge of acid rain in the northeast has largely come to an end, and there is evidence that the health of red spruce is on the rise, regionally. But the impacts of acid rain on soil, tree health, and plant regeneration continue to reverberate. Base cation depletion, particularly at high elevation, continues to limit the ability of trees to uptake nutrients from the soil.

In 1998, Vermont experienced a severe ice storm that took its toll on the CHMU. Today, one can still see evidence of the ice storm in certain landscape positions. Hit particularly hard were the mid and upper elevation paper birch. The ice storm caused extensive limb breakage, and poor soil nutrition caused by acid rain hampered the ability of birch to properly recover from the ice storm. Paper birch continues to decline in overall health and their weakened state leaves them susceptible to insect and disease agents that may not have been a concern in otherwise healthy paper birch.

Over time the forests of the CHMU have been, and in some cases, continue to be impacted by biotic factors like forest pests and diseases. Some of these have significantly altered the composition of our forests such as butternut canker and Dutch elm disease. During the 1980's large populations of the native forest tent caterpillar defoliated thousands of acres of forest within the CHMU. A smaller outbreak occurred between 2004-2006. Very small areas of gypsy moth defoliation have been seen in the past, but have been very limited due to the small areas of preferred food sources such as oak and poplar.

During the late 1980s, pear thrips had a significant impact on the health of sugar maple resulting in thin foliage and extensive dieback. This insect pest is believed to be partly responsible for a general decline in sugar maple health in parts of the CHMU. The North American Maple Project (NAMP) plot in Huntington has experienced greater crown dieback than the statewide average in recent years, likely due to a combination of factors including insect defoliation, weather events, and nutrient depletion.

Oystershell scale is an insect pest which most commonly impacts beech, but can also affect sugar maple and yellow birch. A particularly heavy infestation impacted the Camel's Hump area in the mid-1990s. Small infestations continue to impact the forests of the CHMU on a 4-5-year cycle.

Other common forest pests and diseases have been found throughout the CHMU, as in most other forests in Vermont, including beech bark disease (BBD), *Eutypella* canker on maples, and *Nectria* canker on a host of hardwoods. Other examples of common forest pests and diseases include anthracnose disease on leaves of maples, and birch leaf miner on birches. Usually these pests and diseases are not a large problem, but run their course with minimal impacts on the forest.

One notable example of a disease which has had a significant impact on Vermont's forests, including the CHMU, is beech bark disease. Beech is a primary component of the northern hardwood forests on the CHMU. BBD occurs from a combination of a scale insect and two species of fungi. The disease leads to widespread decline and death of beech trees. The "killing front" of BBD came through the CHMU in the 1970s and 1980s. Some trees display a resistance to the disease. The death of overstory beech trees often leads to aggressive root sprouting of beech saplings. Beech is very shade tolerant and the prolific sprouting can depress the natural regeneration of other associated species such as sugar maple and yellow birch. In this way, beech bark disease is having a significant impact on both the overstory and understory of the forests of the CHMU.

#### *Current Forest Health Conditions*

Each year, forest health specialists from FPR conduct aerial forest health surveys to document and map the extent of certain tree diseases and insect species. In recent years, surveyors have continued to document the lingering impacts of beech bark disease, as well as the decline of birch at the upper elevations. Forest health monitoring plots in several locations within CHSP were established to track trends in tree health, forest stressors, and regeneration over time.

Moving forward, the impacts of drought and frost damage loom large as climate change casts a shadow of uncertainty. Earlier bud break as a result of shorter, milder winters has been well documented, making many species susceptible to late spring frosts. Meanwhile, total precipitation is expected to increase under most climate change scenarios, but the timing and distribution of that precipitation will grow less certain. It is anticipated that drought may be a larger issue in the future than it has been to this point. (For additional information on climate change impacts, see section III.G).

## 2. Invasive Exotic Species Assessment:

Non-native invasive plants and insects pose one of the larger threats to forest health conditions in the CHMU, and one which ANR is only recently beginning to take an active approach in controlling. Invasive species can have a wide variety of negative impacts on ecosystem health and forest productivity including displacing native species and reducing biodiversity, interrupting natural succession, degrading wildlife habitat and disrupting the food chain, precluding commercial timber regeneration, and changing the ways ecosystems function by altering nutrient, water, or light availability, hasten erosion and alter soil chemistry.

The CHMU was largely protected from invasive plant species for a long time, because its forested habitat was largely unfragmented, while most invasive plants in the region prefer exposed edge habitats. Small populations of invasive plants have been present for a long time in the forest interior around old cellar holes and were planted there by early settlers. These occurrences were isolated and posed little threat to the surrounding forest health. However, in recent years ANR staff have seen a proliferation of invasive plant species along roads, parking areas, and log landings, even within the interior portions of the unit. Invasive plant species follow disturbance, thus areas that have a history of intensive land use are more likely to host invasive species. (See table on p. 59 for locations of invasive plant species populations).

Climate change will likely worsen the proliferation of invasive species by giving them a competitive advantage. Warming temperatures will facilitate their northward expansion providing the opportunity for them to take advantage of weakened ecosystems and outcompete native species. The increased forest disturbance associated with climate change provides an optimal setting for these disturbance-loving species to spread.

Perhaps of even greater concern than invasive plants is the threat posed by invasive insect species, such as the emerald ash borer (EAB) and the Asian longhorned beetle (ALB). ALB was first identified in the US in 1996 in Brooklyn, and Long Island, NY. Emerald ash borer was first identified in the US in southeast Michigan in 2002. Since then, Vermont foresters have been monitoring the spread of both species. There have been several ALB outbreaks in the Northeast and the beetle has had a devastating impact on communities such as Worcester, MA. The beetles feed on maples, elm, ash and poplar, among others. EAB has spread steadily since its arrival in Michigan and is now established in every surrounding state and province to Vermont. Neither pest has yet been found in Vermont.

Hardwoods potentially impacted by EAB and ALB make up a significant portion of the CHMU and the arrival of either species would have a serious impact on forest health as well as planned management activities. At this time, no specific management adjustments will be made on the CHMU in anticipation of ALB. In 2012, VTFPR produced guidance on how landowners could manage forests in response to potential threats posed by EAB. These guidelines will assist ANR in responding should an outbreak of EAB occur near or within the CHMU. One needn't look too far in the past to see the potential impacts of invasive insect species. Dutch elm disease, butternut canker, chestnut blight, and beech bark disease are all of non-native origin and each has effectively modified the role its host plays in the forest ecosystem.

Hemlock woolly adelgid is another non-native pest that has the potential to spread throughout Vermont. Current populations are restricted to southeastern Counties. Birds can carry the insect, so distribution may be difficult to predict. Currently there are no plans to alter management of hemlock in CHMU.

3. Browse Sensitivity Assessment:

During the forest inventory for CHMU and while conducting other daily management activities, foresters made qualitative observations of browse pressure. For the most part, browse pressure on the CHMU is low to moderate. In recent years, foresters have observed elevated browse pressure in stands that have been treated through timber harvesting. ANR will continue to monitor browse pressure and may need to adjust silvicultural methods should deer densities increase.

<b>Invasive Plants of Camel's Hump Management Unit</b>					
<b>Species Name</b>	<b>Common Name</b>	<b>Distribution</b>	<b>Estimated % Cover</b>	<b>Sites Where Found</b>	<b>Present Threat to Native Plant Communities</b>
Rosa Polyantha	MultiFlora Rose	Dense, large bushes adjacent to the lower part of road	80%	Bombardier Road, Bolton	High
Rhamnus sp	Buckthorn	Pockets of saplings adjacent to the lower part of road, seedlings spreading across drainage up hillside next to river rd.	20-50%	Bombardier Road, Bolton	High
Lonicera Sp.	Honeysuckle	Scattered medium to large bushes adjacent to the lower part of road	10%	Bombardier Road, Bolton	Moderate
Rosa Polyantha	MultiFlora Rose	Seedlings to large bushes scattered alongside Preston brook, along west side of Honey Hollow town road near parking area	10-25%	Honey Hollow Town Rd., Bolton	Moderate - but high potential
Rosa Polyantha	Multiflora Rose	Large wall of bushes alongside meadow edge of former Lafreniere hunting cabin site	100%	Honey Hollow Town Rd., Bolton	Moderate
Lonicera Sp.	Honeysuckle	Scattered along roadsides, landings	1%>	Honey Hollow State Rds., Bolton	Low
Rosa Polyantha	MultiFlora Rose	Scattered along roadsides, one large bush on a landing	1%>	Honey Hollow State Rds., Bolton	Low

Phragmites australis	Phragmites	Very small patch in ditch	1%>	Honey Hollow State Rds., Bolton	Low
Fallopida Japonica	Japanese knotweed	Small pocket on the Long Trail extension by Winooski River, near Lafreniere farm fields	100	River Road, Bolton	Moderate
Lonicera Sp.	Honeysuckle	Alongside roads and in landings. Small plants to bushes	5%	Camels Hump Road Network	Moderate
Rosa Polyantha	MultiFlora Rose	Alongside roads and in landings. Small plants to bushes	5%	Camels Hump Road Network	Moderate
Berberis thunbergii	Barberry	Spread throughout the woods directly around the parking area	20-30%	Bamforth Ridge Trailhead	Moderate
Lonicera Sp.	Honeysuckle	Very sparse small plants along roads and on landings accessed through RV park	1%>	Robbins Mt WMA	Low
Rhamnus sp	Buckthorn	A few seedlings along roads accessed through RV park	1%>	Robbins Mt WMA	Low
Lonicera Sp.	Honeysuckle	Several large bushes surrounding the small public access parking lot	5%	Robbins Mt WMA	Low

## G. Climate Change Assessment- Anticipated Impacts

The effects of climate change are a developing management issue in the Camel’s Hump Management Unit. If the most conservative current models of climate change are accurate, the CHMU, like the rest of the region, will experience strong impacts over the next 50-100 years. These changes may have important consequences for forest nutrient cycling, timber productivity, forest pest ecology, wildlife habitat, and our winter recreation opportunities in the forest. Assessing changes in our climate and the potential effects on the CHMU will influence how we manage the forest to improve resiliency and adaptability.

While there was no specific “climate change assessment” conducted for the CHMU, the following information is expected to broadly apply here, as it is expected to do so across the Vermont landscape.

Historical data have shown changes across Vermont over the past 50 years, including:

- Summer temperatures increased 0.4°F per decade
- Winter temperature increased 0.9°F per decade
- Spring thaw arrives 2.3 days earlier per decade
- Precipitation increased 15-20%, with 67% from “heavy precipitation” events

### 1. Anticipated Climate Change Effects

Scientific studies estimate a variety of potential changes in the future, including:

- Increased temperatures, especially in winter
- Increased precipitation, especially rain in winter
- Increased extreme weather events, including floods, wind storms, and fires
- Longer growing seasons, shorter winters
- Changing biological interactions

These potential changes are expected to have a range of effects on the forested ecosystems of the CHMU, as with forests across the State. The following table lists examples of anticipated effects and time frames of many key climate factors on upland forests of Vermont.

### Expected Climate Change Effects and Timeframes<sup>4</sup>

Key Climate Change Factors	Expected Effects	Timeframe
Warming temperatures	Compositional changes associated with changes in thermally suitable habitat (loss of cold-adapted species and increase in warm-adapted species)	Long-term, but localized effects could occur on a shorter timescale
	Increase in overwinter survival of pests, such as balsam and hemlock woolly adelgid	Immediate
	Increased physiological stress, resulting in increased susceptibility to pests and disease, decreased productivity and increased tree mortality	Immediate
	Increased evapotranspiration, resulting in a decrease in soil moisture; moisture limitation/stress negatively impacts productivity and survival in many species	Immediate
	Increased decomposition rate of organic material may enrich soils and make them more suitable for competitors	Long-term, but localized effects could occur on a shorter timescale
	Decrease in winter snow pack, leading to change in deer browsing patterns, which affects regeneration	Immediate

<sup>4</sup> Source: TetraTech. 2013. Climate change adaptation framework. Prepared for Vermont Agency of Natural Resources.

Key Climate Change Factors	Expected Effects	Timeframe
	Lengthening of growing season resulting in changes in species competitiveness, especially favoring non-native invasive plants	Immediate
Increase in extreme storm events	Increased physical damage and disturbance, leading to gap formation, which could facilitate the spread of invasive plants	Immediate
Phenology (timing)	Longer growing season	Immediate
	Early spring thaws/late frosts can damage buds, blossoms and roots, which affects regeneration	Immediate
	Change in freeze/thaw cycles could disrupt regular periodicity of cone cycles	Immediate
	Asynchronous changes in phenology may negatively impact some migratory species and pollinators	Immediate
Increase in fire risk	Loss of fire intolerant species and increase in fire tolerant species, such as red and pitch pines	Long-term, but localized effects could occur on a shorter timescale
Increase in fire risk (cont.)	Earlier and warmer springs and smaller snow packs, and hotter drier summers conducive to increased fire risk	Immediate
Increase in number of short-term droughts	Declines in forest productivity and tree survival associated with water limitation	Long-term

## H. Historic and Cultural Assessment

The lands of the CHMU have a rich and varied historic and cultural context. From the Native Americans to today's citizens this area has held, and continues to hold significance to the enrichment of our lives.

Mountainous terrain dominates much of the land area of the CHMU, which limited areas for settlement by both Native Americans and early European settlers. Most of the soils are rocky and quite steep, making tillage challenging, and is classified as least favorable for farming on the State's land classification map. Due to this, homesteading was short lived and not very prevalent within most of the CHMU.

An area's sensitivity to the potential for a Native American site, also known as a pre-contact site, is heavily influenced by its proximity to water. Given this, the area of greatest potential are the lands along the Winooski River, Huntington River and around small mountain water bodies and their tributaries. Other areas of significant importance to the Native Americans included mountain tops; the Waubanakee called Camel's Hump Tah-wak-be-dee-esso wadso, or Tahwahbodeay wadso, which meant 'the mountain that is like a seat', or 'resting place'.

Locations of some of the Native American and Euro-American sites within the CHMU are known, but a complete survey has not been conducted. As projects are proposed an analysis is done utilizing established criteria for ranking potential to encounter these types of sites. If it is determined that the potential exists for a Native American or Euro-American site, further analysis would be done. Typically, sites of interest include areas adjacent to a water body, flat, level ground, the confluence of streams or rivers, unique features such as caves or hill/mountain tops, remote ponds, springs, quarries, floodplains, natural travel corridors, and wetlands. If a site exhibits the potential to be archeologically sensitive, further studies by trained professionals would be warranted.

For more information on the cultural history and archeological sensitivity refer to Appendices C & D.

According to the F. W. Beers Atlas done during 1869-1873 for the lands within the CHMU, there were shown 49 homesteads, four sawmills, and one school. Most of these were located near streams and town roads, a few were in more remote locations. The largest sawmill complex was in Huntington, located near the present day Forest City Trail close to Brush Brook, called Forest Mills. Most of the homesteads were abandoned by the end of the 1800's, as families moved west. Some of the old stone cellar holes, stone foundations, and field edge stone walls can still be found. Only one of the homes, and associated barns, remains today. Built in 1820 by the Preston family, the structures are located in Bolton, at the junction of Honey Hollow and Duxbury Roads. Photo-documentation, measurements and assessments were done on many of the old cellar hole locations in the past ten years.

Recreational use of the lands surrounding Camel's Hump has a long standing tradition. The first hiking trail was the Old Huntington Trail, called the Burrows Trail today, established in the early 1800's. Also during the mid-1880's Sam Ridley established an opportunity for visitors from down country to visit the area. Visitors would travel to North Duxbury via train, take a horse drawn carriage part way up the mountain, then continue on horse or pony to near the summit, where a hotel of sorts had been established. During the early 1900's the GMC started clearing of the Long Trail, a section of which goes over the top of Camel's Hump, and other mountain peaks within the CHMU. Other types of trails, snowmobile, cross-country ski, and mountain bike, were established in the late 1900's.

Other highlights of historic interest for the CHMU include:

- Most the CHMU was logged over in the 1800's and early 1900's; there are only relatively small areas that were undisturbed or minimally disturbed.
- 1860- Observatory built on the summit, bridle path established on the North Duxbury side to near the summit.
- 1865- Sam Ridley's hotel built in what is now known as the Hut Clearing; burned down in 1877.
- 1908- Huts built at the location of the former hotel by the Camel's Hump Club.
- 1911- First fire lookout in Vermont established on Camel's Hump summit; phone line established to Hut Clearing.
- early 1900's- large tree planting effort of about 400,000 tree seedlings including Norway spruce, white cedar, white pine, and Scotch pine, primarily to replant areas burned over in 1903; almost total failure, very few of these trees remain today.
- 1944, October 15- B-24J Liberator bomber crashed just below the summit of Camel's Hump, killing nine servicemen, one survivor.
- 1965- Camel's Hump natural area established.
- 1968- Camel's Hump designated as a National Natural Landmark.

## I. Recreation Assessment

Many thousands of people visit the CHMU every year. Most visitors are from the northeastern United States, but this landmark attracts people from all over the world. The primary reason to visit is to recreate. Most visitors come to hike, while still others come to cross-country ski or hunt. A wide range of other activities occur here as well, including wildlife observation, snowmobiling, mountain biking, fishing, and swimming. For many years one of the primary focuses of management on the CHMU has been recreation, and will continue to be into the future.

During 2011, most of the trails on the CHMU were analyzed in detail for trail maintenance and improvement needs. All of this data was recorded digitally, including longitude/latitude coordinates from a hand-held GPS unit. This analysis will better prepare us for trail work planning into the future. The focus of trail work is public safety, erosion control, user enjoyment, and providing access to interesting places.

Over the years, the trails on the CHMU have received a lot of attention from various trail crews, volunteers, contractors, and staff. Trail improvements have focused on improving the hiking experience and protecting adjacent natural resources. Trail maintenance activities include:

- Installation of proper erosion control structures such as grade dips and rock steps
- Installation of drainage structures such as ditches
- Clearing brush and tree blow-downs
- Building bridges over streams
- Constructing benches
- Refurbishing old shelters and cabins
- Building parking areas and clearing them of snow in the winter
- Maintenance of trailhead bulletin boards and register boxes

Trail improvements are necessary and ongoing. Thanks in great part to the federal Recreational Trails Program grant funding, and generous support from a variety of recreation partners, the trails on the CHMU are in good shape over all. More work does remain however. A listing of the trails and associated structures on the CHMU can be found on pages 65-66.

In addition to the numerous trails that begin and end on state land, it's important to recognize that just as the CHMU exists in a landscape context when it comes to wildlife habitat connectivity, it does so too in relation to recreational pursuits. There are multiple trails that begin on private land and provide access to the CHMU. The Catamount Trail and the Long Trail have significant mileage in the vicinity that is not on the CHMU, therefore many people enter the property from surrounding private lands. Importantly there are adjacent properties that are conserved or accessible for public recreation. One such parcel is the former Lathrop parcel to the north of the Phen Basin Block and depicted on the map on page 79. The state has a public access easement on this property that allows visitors to enter from state land and use the forest access roads.

While many visitors explore the CHMU through a trail experience, it is important to recognize that not all recreation is trail based. One such use that is gaining rapidly in popularity is backcountry skiing. While

many backcountry skiers utilize trails to climb into the upper reaches of the CHMU, they often descend through the woods through natural “glades”. Backcountry skiing is an allowed use on the CHMU. In some cases however, a small number of users are illegally cutting vegetation in order to create skiable glades. It is important to recognize that unauthorized cutting of glades can have a significant adverse impact on wildlife, forest structure, and ecosystem health. ANR is in the process of revising and improving the policy related to backcountry skiing on Agency lands. The State is working with the recently formed Backcountry Alliance and the CTA to develop this policy, and assisted in the recently released “Backcountry Ethics Statement”.

Another growing use of the CHMU is rock climbing. ANR recently created a new policy for rock climbing and related activities on Agency lands. The goal of the policy is to guide use so that this activity occurs in an appropriate way and in appropriate locations. Cliff plant communities are often sensitive and rock climbing can have an adverse impact if done in certain areas and without regard to the natural resources at hand. The policy on FPR lands is that climbing is allowed unless otherwise stated through the creation of a “cliff reserve.” Section IV of this plan establishes two cliff reserves within the CHMU. On WMAs, climbing remains prohibited, unless otherwise stated.

While most visitors have a safe and enjoyable experience on the CHMU, occasionally visitors get injured or lost, and a search and rescue operation needs to be initiated. The Department of Public Safety (DPS), in cooperation with The Vermont State Police, is responsible for all search and rescue operations. They coordinate with local town rescue squads, Fish and Wildlife Game Wardens, and sometimes call on FP&R staff for access and information.

For a better understanding of how many people visit the CHMU each year refer to Appendix G.

### TRAILS AND SHELTERS WITHIN THE CAMEL’S HUMPH MANAGEMENT UNIT

Trail	Type	Use Level	Length (miles)	Location
Allis	Hiking	Low	0.3	South of Camel’s Hump summit, near Montclair Glen Lodge
Alpine	Hiking	Low	1.7	Around east side of Camel’s Hump; upper elevations
Baird in the Bush	Mountain biking	Low	1.4	Phen Basin Block, Fayston
Beane	Hiking	Low	1.5	Access to the LT east of Hanksville
Burrows	Hiking	Very high	2.1	West side of Camel’s Hump
Burrows-Forest City Connector	Hiking	High	0.1	West side of Camel’s Hump
Busternut	Mountain biking	Medium	0.9	Howe Block
Camel’s Hump View	Accessible	Medium	0.8	East side of Camel’s Hump
Catamount (sections of)	X-C ski	Medium	14.5	CHSP and Hunt. Gap WMA
Chain Gang	Mountain biking	Low	1.4	Phen Basin Block, Fayston
Clinic	Mountain biking	Medium	1.5	Howe Block
Cyclone	Mountain biking	Medium	0.8	Howe Block
Cyclone Connector	Mountain biking	Medium	0.5	Howe Block
Dean	Hiking	Medium	1.0	East side of Camel’s Hump
East Loop	Mountain biking	Low	0.5	Phen Basin Block, Fayston
Enchanted Forest	Mountain biking	Medium	1.4	Howe Block
Forest City	Hiking	High	2.2	South of Camel’s Hump
GS	Mountain biking		0.8	Howe Block
Hemlock Hill	Hiking	Low	1.0	Phen Basin Block, Fayston

Jerusalem	Hiking	Low	2.4	South of Stevens Block, CHSF
Lion's Ridge	X-C ski	Low	2.0	Upper Honey Hollow, CHSP
Long (sections of)	Hiking	Med. to high	14.6	From Winooski River to just south of Mad River ski area
Lower Cyclone	Mountain biking	Medium	1.0	Howe Block
Monroe	Hiking	Very high	3.1	East side of Camel's Hump
Ridley Crossing	X-C ski	Low	1.5	East side of Camel's Hump
Winooski Riverside	Hiking	Low	1.0	North side of Camel's Hump
VAST 17	Snowmobile	High	6.0	South of Camel's Hump
VAST 17A	Snowmobile	Medium	1.9	South of Camel's Hump
VAST 100A	Snowmobile	High	7.5	South and east of Camel's Hump

TRAIL TYPE	MILEAGE
Hiking	30.8
Cross-Country Ski	18.0
Snowmobile	15.4
Mountain Bike	10.2
ADA Accessible	0.8

**TOTAL: 75.2 miles**

Structure	Type	Capacity	Use Level	Condition
Bamforth Ridge Shelter	3 sided frame	9	Medium	Very good (2002)
Bamforth Ridge Tenting	Wooden platforms	10	Medium	Very good (2002)
Birch Glen Camp	4 sided log	12	Low	Good (1930)
Hump Brook Tenting	Wooden platforms	30	High	Good (1991)
Montclair Glen Lodge	4 sided log	10	High	Very good (1948)
Montclair Glen Tenting	Wooden platforms	8	High	Good
Theron Dean Shelter	3 sided log	5	Low	Good (1966)



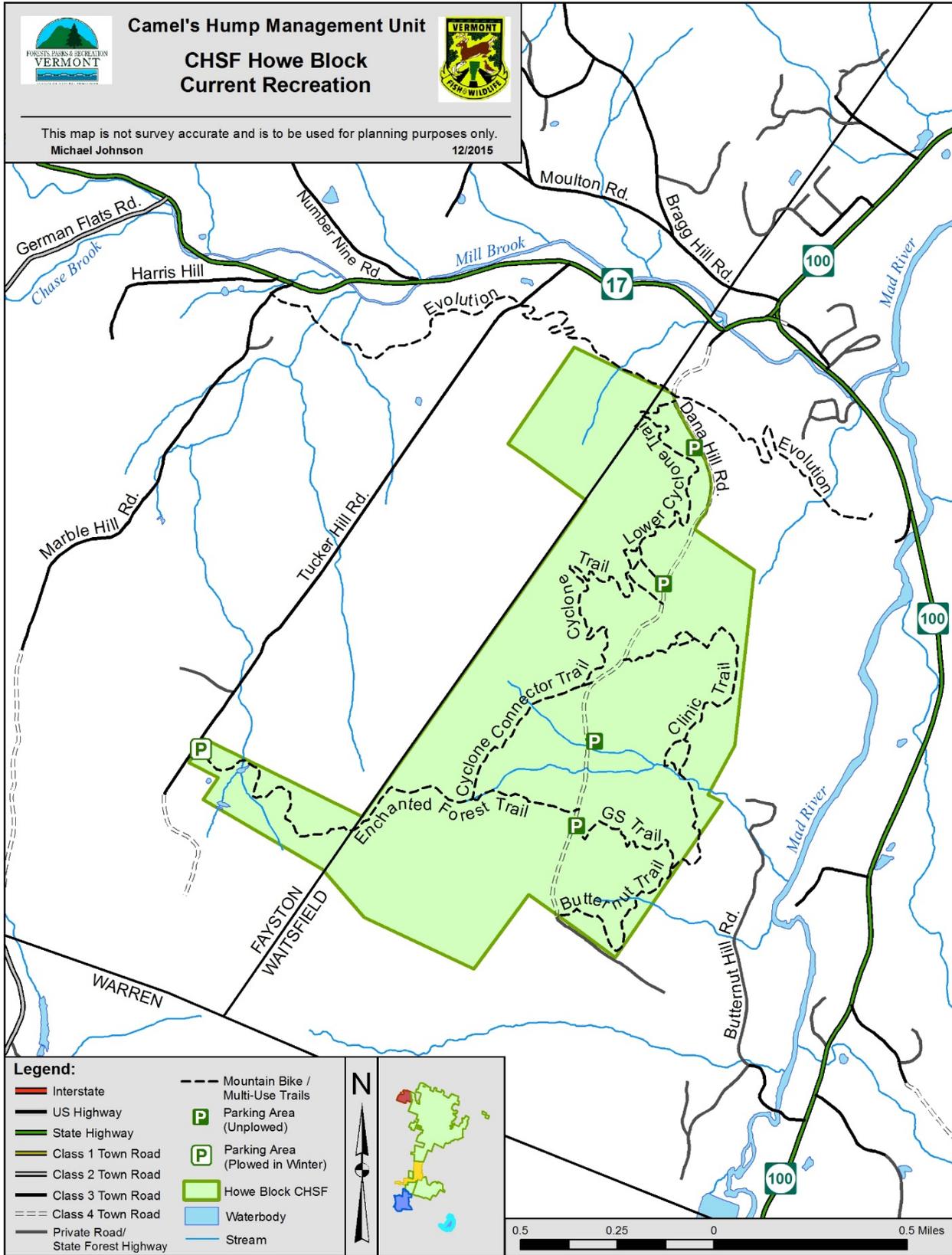


Figure 13- Current Recreation, Howe Block Map

## Recreation Opportunity Spectrum

Recreation Opportunity Spectrum (ROS) is an inventory and assessment process designed to focus on the character of experiences a recreational user can expect to find on a parcel of land. Developed by the US Forest Service for application in the western United States, this system has been adapted for use in the eastern United States. Use of the system will result in the public being given consistent messages on the types of recreation experiences to expect in various areas, regardless of being on State or Federal lands.

There are six ROS categories developed for New England. These categories range from the highly developed (urban) to the undeveloped (primitive). The characteristics used to map these ROS categories are based on:

1. Physical setting – remoteness, size of the area and evidence of humans.
2. Social setting – the amount and type of contact between individuals and groups.
3. Managerial Setting – the amounts and kinds or restrictions placed on people’s actions.

Seasonal Classification: Three of the six ROS categories exist in the CHMU. They include semi-primitive non-motorized areas, semi-developed natural areas, and developed natural areas. which vary dramatically based upon the season: winter or summer. Recreational use of the CHMU varies widely from summer season to winter season as some trails become motorized by snowmobiles in winter, road sections go unplowed or Mad River Glen Ski Area begins operating, to name a few examples. Conversely, as winter season transitions to summer season, trail heads become parking areas, roads re-open and trails become busier. These seasonal changes can lead to a shifting in the classification of a given area depending on the season. For the intent of this management plan, “Winter” will be defined as mid-November to Memorial Day Weekend and “Summer” will be defined as Memorial Day Weekend to mid-November.

1. **Semi-primitive non-motorized areas** are characterized by a predominantly natural or natural-appearing environment of relatively medium to large size, at least 1,000 acres. Interactions between users are low, but there is often evidence of other users. There is a moderately high probability of experiencing isolation from human development, use and impact. The areas are at least 1/2 mile from maintained roads or trails designated for motorized or mechanized use. There may be unimproved roads and skid trails within the area. Timber harvesting and vegetation management may occur on a short-term basis. Road and trail density is low. On-site restrictions and controls are present but subtle. During the summer season, the semi-primitive non-motorized areas represent 11,281 acres or 44% of the CHMU. During the winter season, the semi-primitive non-motorized areas represent 9,947 acres or 38%.

2. **Semi-developed natural areas** are characterized by a natural appearing environment. Evidences of the sights and sounds of people are moderate. Interaction between users may be low to moderate, but evidence of other users is prevalent. Areas are within 1/2 mile of improved roads. Motorized and mechanized uses may be permitted. Many timber harvesting and vegetation management practices are compatible. Road and trail density is moderate. On-site restrictions and controls are noticeable but harmonize with the natural environment. During the summer season, the semi-developed natural areas

represent 10,246 acres or 39% of the CHMU. During the winter season, the semi-primitive non-motorized areas represent 6,592 acres or 25%.

**3. Developed natural areas** are characterized by a substantially modified natural environment. Sights and sounds of people are readily evident. Interaction between users is often moderate to high. Road and trail density is moderate. Many timber harvesting and vegetation management practices are compatible. Motorized and mechanized uses may be permitted. Structures are readily apparent and may range from scattered to small clusters that could dominate the landscape. On-site restrictions and controls are obvious and may be numerous, though they are largely in harmony with the developed environment. During the summer season, the developed natural areas represent 4,548 acres or 17% of the CHMU. During the winter season, the developed natural areas represent 9,536 acres or 37%.

The CHMU does not currently comprise any land that would be categorized as “Primitive”, “Semi-Primitive Motorized” or “Highly Developed.”

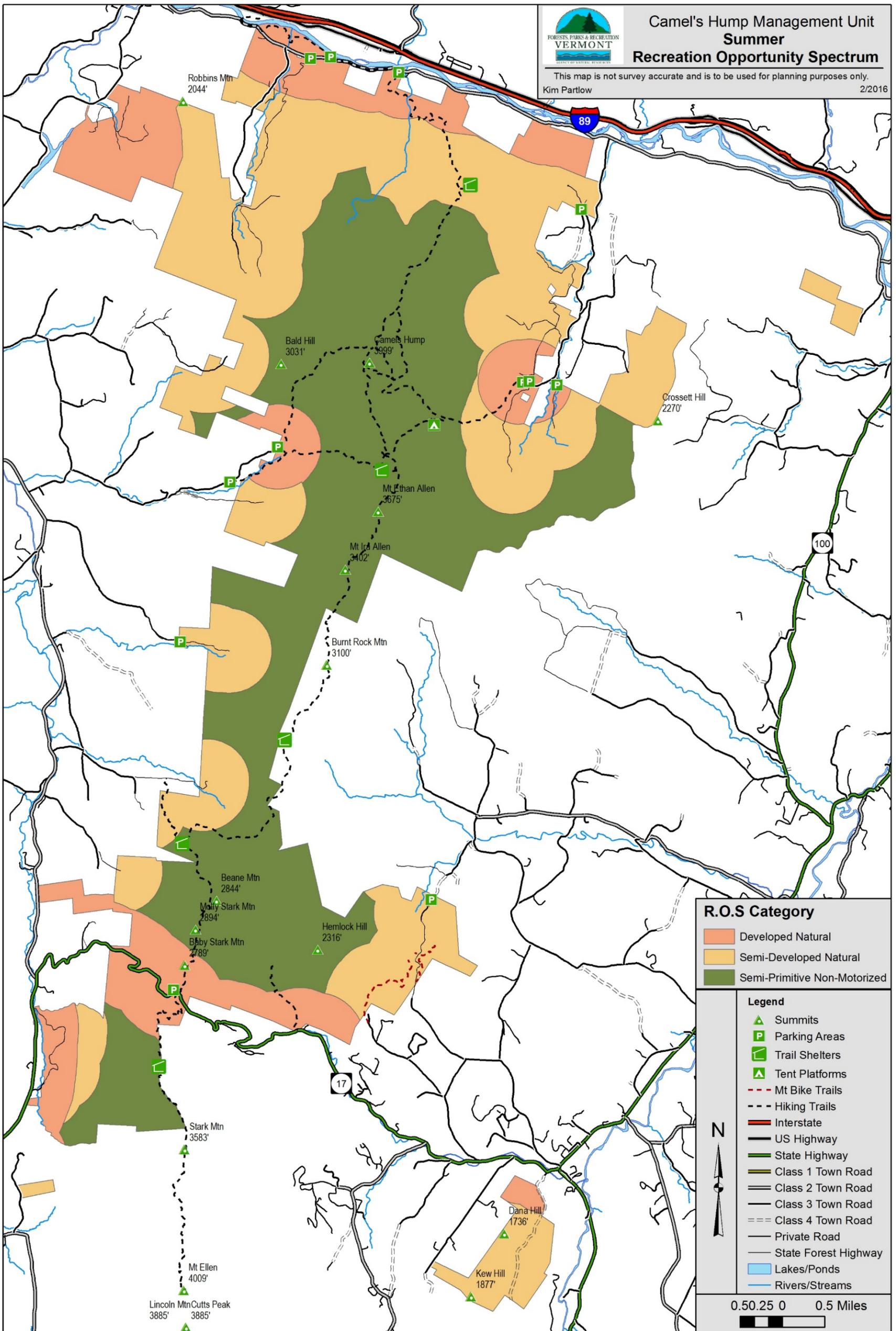


Figure 14- Recreation Opportunity Spectrum Map, Summer

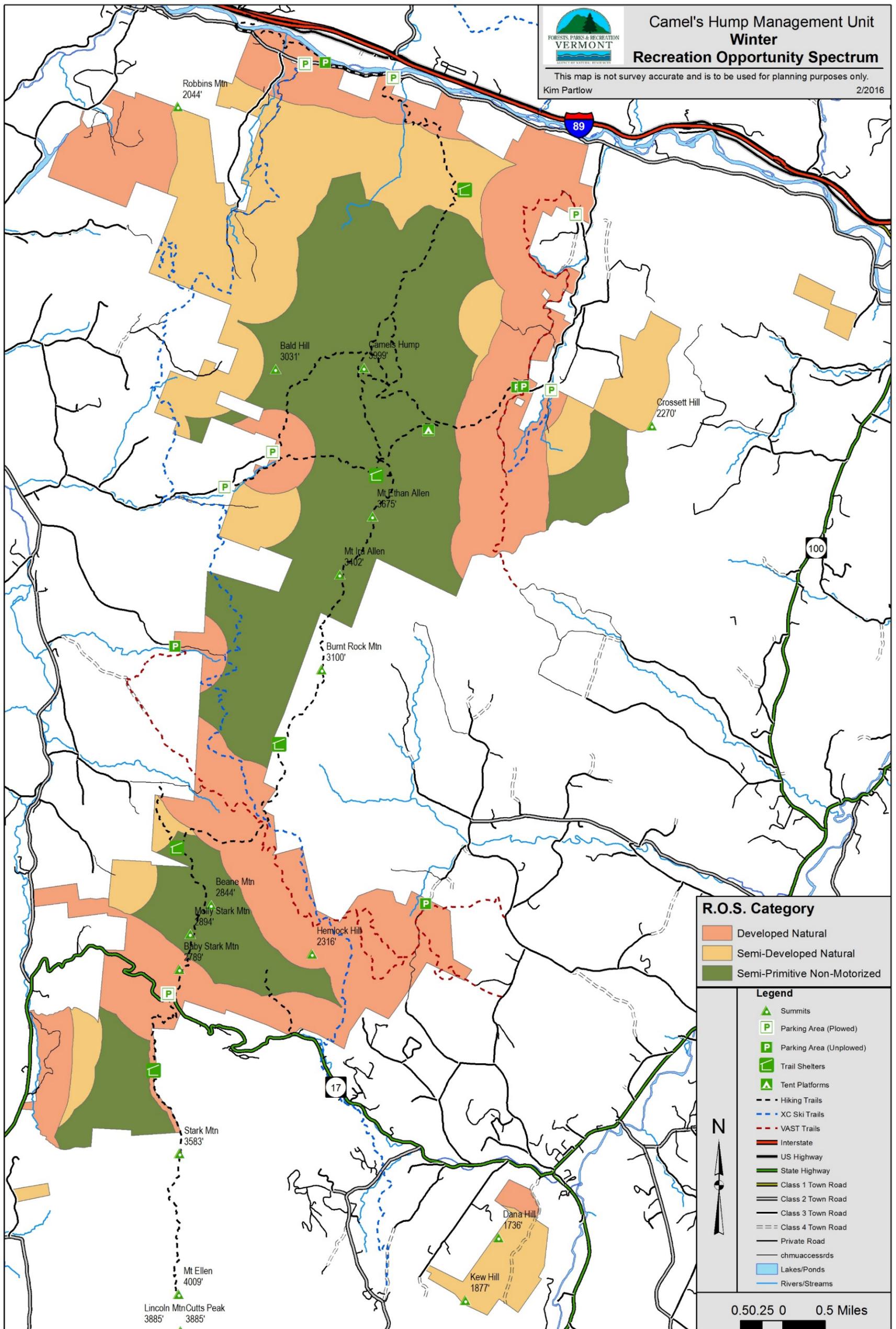


Figure 15- Recreation Opportunity Spectrum Map, Winter

## **J. Road Infrastructure, Public Access, and Structures Assessment**

There are sixteen miles of gravel forest access truck roads within the CHMU. Associated with these roads are six substantial bridges and twelve large (over 4' diameter) culvert crossings, and numerous smaller culverts. There are also several bridges and large culverts associated with recreational trails beyond these roads. Controlling access to this valuable investment are nineteen gates. These gates are closed and locked most of the time to protect the associated roads.

Over the years a substantial investment has been made to build and maintain these roads. Continuing upgrades and routine maintenance is critical. Due to changes in logging equipment and methods, former standards are commonly inadequate. Securing adequate funding for roads improvements and maintenance is and will continue to be a challenge. Funding sources include the regular forest highway account from the State's general fund, special capital funds appropriations, the State's Lands and Facilities Trust Fund, and Federal grants, such as FEMA storm damage repair funds. Occasionally storm events cause substantial damage such as during Tropical Storm Irene in 2011, and a series of severe storms in June/July of 2013.

A considerable amount of knowledge has been gained over time regarding road building and proper sizing of associated drainage structures. This knowledge will be utilized as we move forward with our road projects.

Within the CHMU are two gravel pits, one on the Duxbury Road in Bolton, and a smaller one on the Connally forest access road in Duxbury. Gravel from these pits has been utilized extensively in repairing and maintaining roads on the CHMU.

Also on the CHMU in addition to the road infrastructure are eighteen parking areas with an approximate capacity of 170 vehicles. Six of these parking areas are plowed during the winter.

Within the CHMU are four cabins/shelters and associated tent platforms adjacent to the Long Trail, one 'ranger' cabin, a tent platform area with eight tent platforms, and one house and barns complex. The trail associated structures are largely maintained by GMC in cooperation with FPR.

## **K. Scenic Values**

The importance of scenic values of the Camel's Hump Management Unit to the public is very high (see appendix E). The forest and mountains in and around the CHMU are viewed daily by commuters traveling the interstate and other roads, by numerous people out their front windows, by travelers as they fly over on their way to distant destinations, and by hikers on the summit ridges. Camel's Hump and the associated lands within the management unit are iconic to the vast majority of Vermonters.

Whether the site distance is far, medium, or close, scenic values are vital to visitors to the land unit and viewers from afar.

Given the high importance of the scenic values to the public, future management decisions will take aesthetics into consideration.

## IV. MANAGEMENT GOALS, STRATEGIES, AND ACTIONS

### A. Management Goals for the Camel's Hump Management Unit

Utilizing the “multiple-use” concept, management of the CHMU embraces several priorities in achieving the goals set forth for this land base. The top priorities of management for the CHMU are to protect and conserve the natural, cultural and scenic resources present, to provide a range of recreational opportunities, to continue to harvest forest products sustainably, and to maintain and enhance diverse wildlife habitats. The relative importance of these goals will vary based on several factors including designation: State Park, State Forest, or WMA. On the two Wildlife Management Areas within the CHMU the primary focus of management is to provide wildlife based recreation including hunting, fishing, trapping, and wildlife observation by creating and maintaining high quality wildlife habitats. Management priority will also vary depending on the Land Management Classification (see Section IV.C, below).

#### Unit-Wide Goals:

***Protect the natural and cultural resources of the Camel's Hump Management Unit.*** The protection of the natural and cultural resources of the CHMU is of the utmost importance and the goal of resource protection is incorporated into everything we do on the CHMU. The natural qualities found here must be retained to protect and conserve aesthetic values, recreational opportunities, watershed values, timber, wildlife, and rare, threatened and endangered species for present and future generations. Proper consideration must also be given to protect important cultural and historic resources. Most of the protection strategies will be directed towards limiting certain activities. Some management activities will be undertaken to enhance this aspect of the CHMU.

***Provide diverse recreational opportunities and trail systems where appropriate and compatible with other goals.*** Recreation is a primary and perhaps the most visible use of the CHMU. Management activities will maintain and enhance recreational opportunities. Most of the recreational pursuits on the CHMU are pedestrian based activities, primarily concentrated on trails. Recreation management strategies are designed to provide an outstanding user experience while minimizing environmental degradation.

***Produce a diverse array of forest products through sustainable management and harvest practices.*** Much of the CHMU is productive forest land that lends itself to the sustainable harvesting of forest products. In fact, much of the CHMU has been designated by legislative statute as areas where management for forest products is among the primary purposes. A range of forest vegetation management techniques will be implemented on lands within the management unit. Forest management strategies are designed to produce high quality forest products while still providing for biodiversity, healthy and vigorous forests, protection of water resources, and the demonstration of forest management techniques to the public.

***Provide high-quality habitat for target and general wildlife species.*** Utilizing a combination of commercial and non-commercial forest management practices, the CHMU will continue to provide some of the best wildlife habitats found in the area. Management operations will promote retention and

enhancement of special wildlife related features. Old field openings will be maintained, large contiguous blocks of forest will remain, streams and wetlands will be protected, softwood cover will be enhanced, mast producing trees will be retained and released from competition from other trees, and critical habitats will be conserved. Areas of late-successional forest, which provide special wildlife habitats such as large snags, coarse woody debris, large tip-up mounds, and other related features will be conserved.

## **B. General Management Strategies and Actions**

Section A above identifies in a broad context the four primary management goals, informally referred to as *Resource Protection, Recreation, Forest Products, and Wildlife*. This section will describe some broad management strategies and actions that will help achieve each of these goals. These are intended to be broad-brush and relevant across the entire management unit. Section C below will consist of the Land Management Classification for the CHMU and will have more site-specific priorities, and management actions.

### **Resource Protection Management- *Protect the natural and cultural resources of the Camel's Hump Management Unit***

Resource protection is incorporated with practically every management action conducted on the CHMU. The goal of resource protection is in the forefront of our minds when considering any new or existing activity on the CHMU. When one considers a management action, what typically comes to mind is a discrete activity- building a trail, ditching a road, etc. As such, there are few management "actions" conducted that can be thought of as furthering the goal of "protection". Some of these actions are listed below, along with general strategies and points to consider that serve to further resource protection efforts:

- Promote an ethic of respect for the land, sustainable use, and exemplary management;
  - Continue to improve public outreach and education efforts aimed at educating users about appropriate uses of state land. Utilize a variety of information outlets including internet, social media, mailings, trailhead signs and others.
  - Conform to all deed restrictions, conservation easements, and legal agreements.
  - Ensure proper waste management at all facilities including trail shelters and parking areas.
  - Limit special use permits and licenses to appropriate activities and locations.
- Conserve biological diversity on the parcel and contribute to the diversity of the larger landscape;
- Maintain and enhance forest ecosystem health;
  - Conduct annual forest health surveys.
  - Consider current insect and disease conditions when determining the timing of various management activities.
  - Work with town forest fire wardens to provide for forest fire control as needed.

- Maintain or enhance quality rank of significant natural communities and protect habitat of rare, threatened, and endangered species;
  - Control or limit invasive species populations to the extent feasible.
  - Monitor impacts from other uses, including recreation and forest product management.
  - When appropriate, allow natural processes and disturbance regimes to prevail
  
- Document, interpret, and protect historic resources;
  - Identify and buffer known and discovered cultural and historic sites.
  
- Promote resilience and adaptation to address climate change scenarios;
  - Retain and enhance the amount and distribution of coarse and fine woody material for nutrient cycling and soil protection
  - Manage for tree age diversity and forest structural complexity across the landscape with particular attention to landscape-level management
  - Enhance forest cover in riparian areas and adjacent upland forests and wetland buffers to maintain natural stream temperatures, wildlife corridors, and to mitigate flooding impacts.
  - Maintain and enhance forest species diversity including trees, shrubs, herbaceous plants, and bryophytes to aid in maintaining forest processes.
  - Maintain rare and sensitive natural communities as potential refugia.
  
- Enhance water quality, fisheries habitat, flood resilience, and wetland function;
  - Improve existing road and trail infrastructure to minimize soil erosion.
  - Adhere to *Riparian Management Guidelines for Agency of Natural Resources Lands*
  - Follow Acceptable Management Practices on Logging Operations to protect water quality and control soil erosion.
  - Follow state and federal permit requirements and conditions related to wetlands, stream alterations, storm water runoff, waste water management, etc.
  - Plan water crossings on roads and trails to withstand increasing frequency and intensity of storm events, thereby enhancing flood resilience and mitigating downstream impacts.

**Recreation Management- *Provide diverse recreational opportunities and trail systems where appropriate and compatible with other goals.***

The intent of recreation management on the CHMU is to provide a variety of experiences for the visiting public within the capabilities of the resource following State policies, rules and regulations and with regard to easement and other restrictions. While there are many different recreational opportunities to enjoy on the CHMU, this land base cannot provide everything. Listed below are various strategies and tactics that are employed on a broad scale within the CHMU to meet the goal of providing diverse recreational opportunities:

- Protect and improve public access;
  - Provide for special use permits and licenses for activities within the capability of the resource through review by the District Stewardship Team
  - Evaluate the capacity of parking areas and respond accordingly to growing need

- Enhance opportunities for wildlife-based recreation, particularly hunting, trapping, and wildlife viewing
- Maintain existing trail system;
  - Continue ongoing maintenance to trails and associated facilities utilizing volunteers, trail crews, available staff, and continuing to work with established recreation partners
  - Continue to allow camping in the GMC maintained structures (see map on page 67)
  - Continue to allow primitive tent camping, in portions of the CHMU in accordance with the FP&R's *Primitive Camping Guidelines*
  - Partner with organizations including the GMC, Vermont Association of Snow Travelers (VAST), the Catamount Trail Association (CTA), and the Vermont Mountain Bike Association (VMBA) to provide enjoyable and safe trail user experiences, and an ecologically sound trail system.
  - Continue to monitor trail usage through the use of trailhead registers, electronic counters, and other appropriate means. Usage data is critical as a basis for management decision-making and justifying continued and enhanced funding for recreation management.
  - Explore options to expand funding for recreation management.
- Explore opportunities to expand recreation where appropriate and compatible with other goals;
  - Evaluate new recreational use requests in the context of total recreational use of the parcel (degree of use, numbers of trails), the Recreational Opportunity Spectrum, and other management goals for the parcel.
  - Partner with organizations including the GMC, VAST, CTA, and VMBA to provide enjoyable and safe trail user experiences, and an ecologically sound trail system.
  - Ensure proper planning for and implementation of new trails where appropriate.
  - Be proactive in recognizing emerging and growing recreational pursuits such as rock climbing, backcountry skiing, winter mountain biking, etc. Work with partnering organizations to ensure sustainable accommodation of emerging recreational pursuits.
  - Engage in proactive education campaigns to inform users of the importance of strong backcountry ethics on public land.

ANR works with partnering organizations to better serve the public with recreation related projects and activities on the CHMU. From time to time these organizations propose changes or refinements to their respective trail systems. The agency has formal agreements with GMC, CTA, VAST, and VMBA. The State also receives ideas and formal proposals from individuals and small groups, and develops proposals within the agency staff as well.

FP&R recently developed a comprehensive approach to be used in evaluating all recreation proposals on FP&R lands. Recreation partners and other interested parties are invited to submit a pre-proposal that briefly describes the project and where the new use/trail will be located. The district stewardship team (DST) evaluates the proposal for its consistency with department policies, property management goals, and the Long-Range Management Plan. If the DST determines that the project is consistent with the LRMP, the applicant would be invited to submit a more detailed project plan. The DST would review the detailed proposal evaluating its sustainability, resource impacts, and user impacts. We anticipate this process to be a collaborative one between the applicant and ANR, and will likely require site visits and many refinements. It is anticipated that many proposals simply won't be feasible, however this process will set clear expectations of both the applicant and ANR.

Within the context of this LRMP, a few recreation project proposals have been submitted to the State for consideration. These projects can be found in the Land Management Classification Section below (section IV.C).

This plan does not include a specific implementation schedule for recreation projects. Maintenance projects are conducted on an as needed basis and are impacted by use levels, weather conditions and other factors. New projects typically include collaboration with partnering organizations and the timing of these projects often depends on factors that are external to ANR.

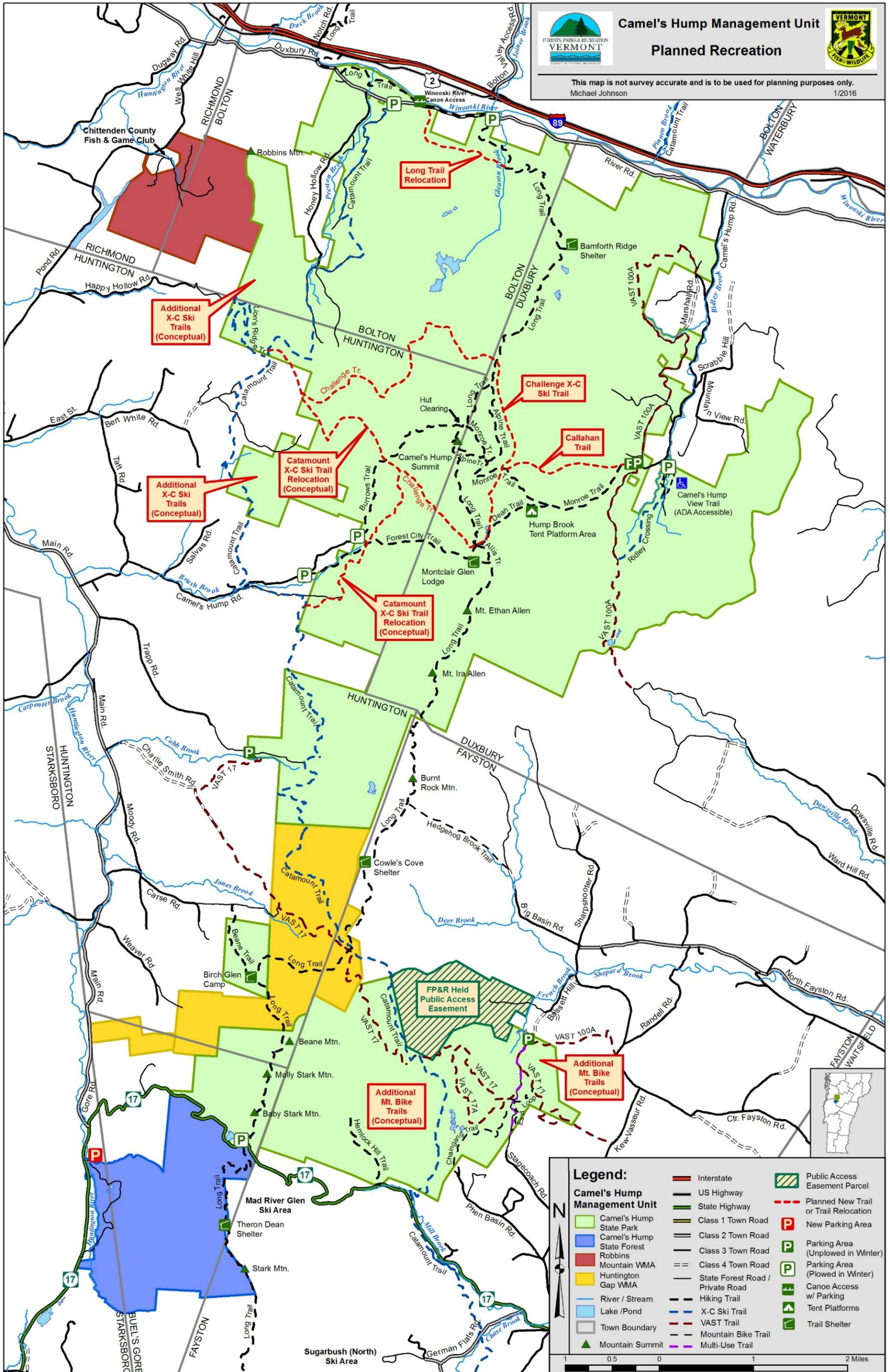


Figure 16- Planned Recreation Map

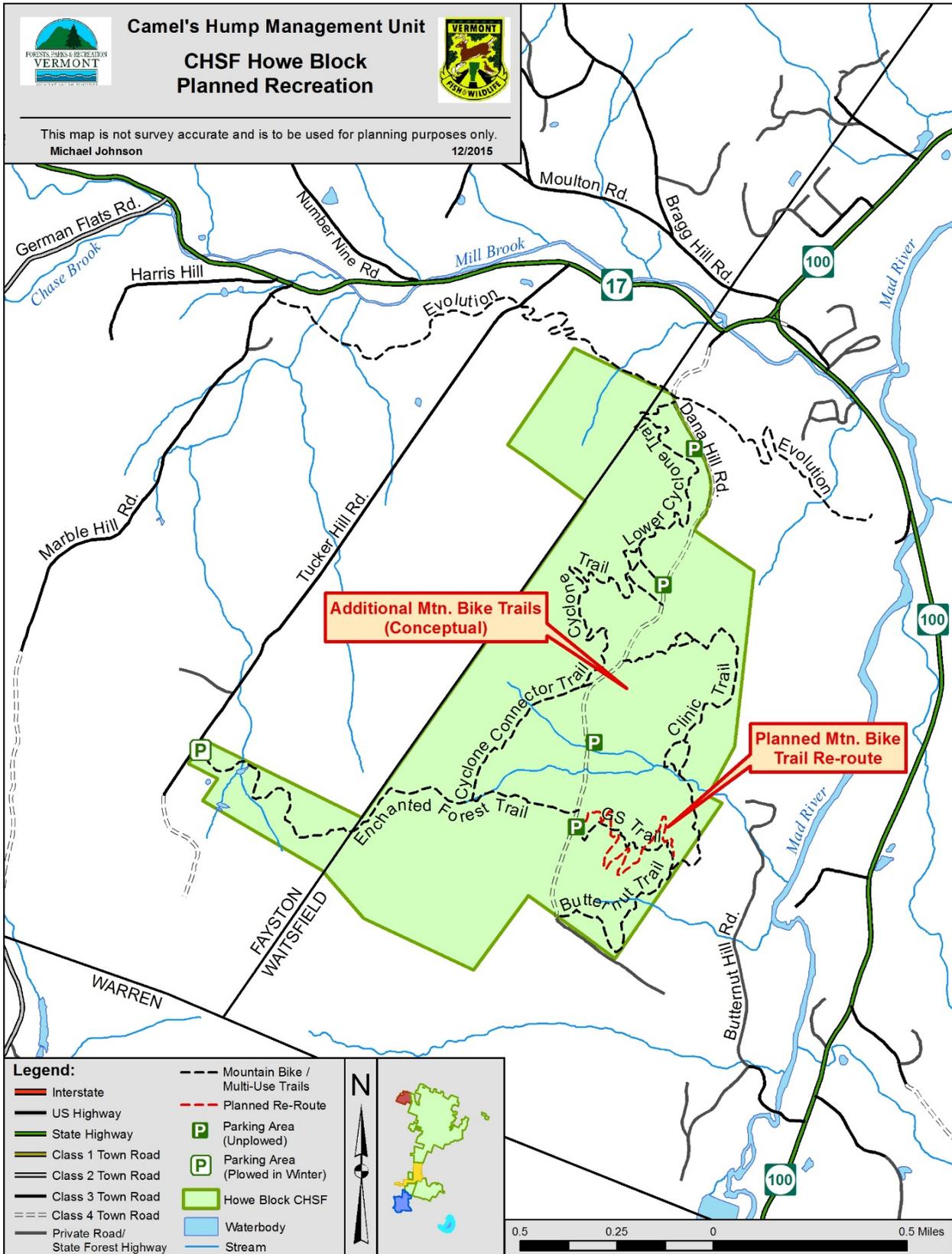


Figure 17- Planned Recreation, Howe Block Map

### **Timber Management- *Produce a diverse array of forest products through sustainable management and harvest practices***

Within the Camel's Hump Management Unit there are approximately 8,500 acres available, accessible, and appropriate for vegetation management activities by the State. An additional 1,473 acres of the Huntington Gap Wildlife Management Area are actively managed for timber by the holder of the timber rights, the A. Johnson Company. Timber management activities include commercial timber and firewood sales, roadside firewood lots, and will increasingly involve the control of invasive plants.

ANR firmly believes that forests can and should be managed to produce a variety of benefits for people and wildlife. Vermont is home to a robust and economically vital forest products industry, of which ANR lands are a small, yet important component. While income generation is never the primary reason to conduct forest harvesting activities on State land, it is still an important consideration. Furthermore, commercial timber harvests are often the only affordable way to accomplish certain types of wildlife habitat management and to achieve management objectives related to landscape diversity and resilience. Listed below are various strategies and tactics that are employed on a broad scale within the CHMU to meet the goal of sustainable production of forest products:

- Utilize a range of established silvicultural techniques;
  - Consider a broad range of peer-reviewed silvicultural guides.
  - Determine the most appropriate cutting regime on a site-specific basis. Such cutting regimes include but are not limited to: single tree and group selection, irregular shelterwood, regular shelterwood, seed tree, clearcut, and crown thinning.
  - Consider the timing of silvicultural treatments (winter vs. summer) in regard to soil and water protection, and desired regeneration.
  - When necessary, limit the type of equipment that is permitted to operate on a given timber sale.
  
- Design silvicultural prescriptions that consider likely climate change scenarios and focus on resilience and diversity;
  - Follow Agency guidelines as they relate to Assisted Migration.
  - Where possible, release softwood regeneration from competition from other trees to enhance the softwood component of the forest.
  - Ensure that advance regeneration is abundant prior to overstory removal when conducting even-age management.
  - Monitor harvests and temporarily halt operations as needed to protect soil, water, and access infrastructure.
  - Match equipment to terrain and harvest objective to reduce soil and stand impacts.
  - Monitor for early detection and removal of invasive plant species. Where invasive plant populations are already established, include aggressive management as a component of any silvicultural technique.
  - Plan silvicultural activities to help control invasive plant populations.
  
- Maintain an adequate road access system;
  - Schedule road maintenance to coincide with upcoming harvesting activities when possible.
  - Maintain roads recognizing that likely climate change scenarios suggest more frequent and intense storm events in the future.

- Replace and enlarge inadequate culverts and stream crossing structures thereby enhancing flood resilience.
- Minimize number of skid roads and trails.
- Follow a strategy of rotating harvesting projects around the CHMU to enable a sustainable harvest in all forest blocks;
  - Undertake periodic forest inventories to assist with guiding future plans and developing proper silvicultural prescriptions.
  - Focus timber production on better growing sites where ecologically appropriate.
- Incorporate FP&R published Acceptable Management Practices and *Riparian Management Guidelines for Agency of Natural Resources Lands* into all harvesting projects to ensure a continuing high level of protection of water quality and soils.

Over the next fifteen, years thirty-four commercial timber sales are planned with an average of 251 acres treated per year involving an approximate total of 3,764 acres. These treatments range in size from 24 acres to 231 acres, with the average sale size of 107 acres. Many of the larger timber sales will take two seasons to complete. Most of the timber sales on the CHMU are conducted in the winter months to reduce impacts to sensitive natural resources and commercial tree regeneration, however summer logging is suitable in some instances when ground conditions allow and soil scarification benefits tree regeneration. Virtually all commercial timber sales are put out to bid. Generally, the high bidder is awarded the contract. Foresters from the Forestry Division of ANR are responsible for all aspects of sale development and administration.

ANR has a robust review process for proposed forest products harvests. Prior to the initiation of a timber sale, a pre-sale cruise, or inventory of the resource is conducted. This inventory includes gathering data related to forest health, species composition, soil characteristics, wildlife habitat considerations, wood product quality and value, and a separate review by an ecologist trained to identify resource constraints, especially as they relate to rare, threatened, and endangered species and significant natural communities. This data is used to develop formal silvicultural prescriptions consistent with the management goals for a given parcel of land. Silvicultural prescriptions are reviewed by the district stewardship team as well as central office staff. Current silvicultural guides are referenced to formulate appropriate strategies for treatment. A variety of silvicultural treatments will be utilized depending on the information gathered and opportunities for demonstration projects.

Access to timber can be challenging on certain parts of the CHMU. As such, it is important for ANR to work closely with neighbors to keep them informed of potential harvesting. ANR is dedicated to improving the quality of access roads. Timber sales are often an opportunity to make improvements to forest access roads and shared rights-of-way alike.

The treatment schedule may at times need to be flexible due to unforeseen circumstances. Examples of this include road washouts, disease or insect infestations, poor conditions for logging such as extended wet periods or lack of cold weather and/or inadequate snow cover. See section IV.D below for an implementation schedule of commercial timber harvests on the CHMU. The “Treatment” column represents a preliminary determination of the type of silvicultural treatment that will be utilized on a given sale. The treatment type will be further refined after completing the pre-sale cruise referenced above.

In addition to commercial timber sales, the State also offers a small number of so called “off-road firewood lots”. These lots range in size from ten to one hundred cords of firewood. These small operations can serve as an opportunity to improve the timber quality or wildlife habitat of an area that might otherwise be too small to warrant a “typical” timber sale contract. Additionally, they help engage smaller operators on state land who otherwise would not be able to compete with larger mechanized operators. As opportunities arise the plan is to continue these sales.

Over the past four decades the State has provided opportunities to the public to cut firewood for home heating on the CHMU. These small firewood lots have ranged from three to six cords each along forest access roads. As time passes, it is increasingly difficult to maintain this program. The hope is to be able to offer a few firewood lots per year into the future, but large numbers of firewood lots will not be possible.

Control of invasive plant species will be a priority for Staff. Strategies for control will include the use of herbicides and manual/mechanical methods such as mowing, pulling, and burning with a torch.

### **Wildlife Habitats Management- *Provide high-quality habitat for target and general wildlife species***

High priorities of management on the CHMU are special wildlife habitat projects and the incorporation of wildlife related management into other activities. A number of the important wildlife habitats found in the CHMU are classified in this plan as land use classification 1.7: *exceptional water resources*, and 2.2: *critical plant and wildlife habitat*. These areas include beaver wetlands, beech mast production areas, deer wintering areas, red oak stands, soft mast production areas (e.g. apple trees), and maintained fields. Specific management strategies aimed at maintaining and enhancing these resources, are listed in section IV.C. Land Management Classification.

There are, however, many other important habitat features found on the CHMU. Examples include vernal pools, small wetlands, seeps, aspen and birch stands, young forest, bobcat denning habitat, raptor nesting trees, snags and cavity trees, and late successional (old) forest. Many of these features are found at a scale that is too small to be useful in the LMC or are of an ephemeral nature. Management activities will be designed to maintain and improve wildlife habitat wherever possible, using a combination of active and passive management.

Aside from habitat management actions listed in the Land Management Classification section, specific wildlife management strategies and tactics that will be regularly implemented on the CHMU are:

- Protect and enhance unique wildlife habitats and features for both general and target wildlife species;
  - Adhere to management guidelines for bats in Vermont prepared by the Vermont Fish and Wildlife Department. Review all timber harvests that are proposed within the CHMU for potential effects on these species, and adjust prescriptions and timing of operations accordingly.
  - When timber management may affect moose winter habitat (mature softwood above 2000 feet in elevation), use Vermont Fish and Wildlife habitat management guidelines for moose.
  - Release from competition and maintain where possible important mast producing trees and shrubs such as beech, apple, cherry, serviceberry, oak, and alders.
  - Avoid or minimize impacts to Bicknell’s thrush and its habitat.

- During management activities, monitor for the presence of important wildlife habitat, such as bobcat denning sites, raptor nest trees, etc., and provide a buffer adequate to prevent disturbance to these features.
- Management strategies should promote adequate numbers of snags, cavity trees, and dead and downed wood. Ideally, a site would contain four to six each of snags and cavity trees >12" diameter per acre, with one to two each of snags and cavity trees >20" in diameter per acre.
- Protect and enhance wildlife habitat through management of all vegetative stages;
  - Use timber harvesting to maintain or increase the proportion of young forest (early successional habitat) found in the CHMU. On the CHMU there are approximately 8,500 acres available for commercial vegetation management. Throughout this area, ANR will attempt to maintain 1-2% (85-170 acres) of the total in young forest (1-15 years), which is consistent with goals for maintaining the state significant northern hardwood forest community. This will be achieved by creating and/or maintaining patches from two acres up to fifteen acres in size for a target of 85-170 acres within the next 15 years. On the average 5-11 acres of forest per year will be added to the early successional stage over the CHMU. In any given year, this number could vary depending on specific forest conditions and proximity to special wildlife habitats.
  - Use a combination of passive and active management to promote development of old forest (late successional forest) and structurally complex forest habitats in the CHMU.
- Assess management activities for impacts to wildlife at the landscape level;
  - Document, maintain, and enhance known and suspected travel corridors to enable wildlife movement across the broader landscape.
  - Maintain the unfragmented character of the CHMU.
- Maintain the high quality of the surface waters within the CHMU to protect aquatic habitat;
  - Identify appropriate Riparian Management Zones in accordance with the *Riparian Management Guidelines for Agency of Natural Resources Lands* to protect riparian function around all wetlands, seeps, streams, and vernal pools. Activities that might result in disturbance or displacement of wildlife from these features will be avoided or minimized.
  - Design roads, trails, and other infrastructure to allow for aquatic organism passage and riparian connectivity.

Implementing the strategies above can be a herculean and perpetual task. As such, ANR will capitalize on the efforts of volunteers, hire individuals or crews using grant funds, attach work of this nature to a timber sale contract, and create special work days for Agency staff. Occasionally the State will utilize a controlled burn to manage forest openings.

Large unfragmented areas of forest are valuable, and necessary to some species of wildlife. As such, the State intends to retain large areas without development of permanent roads, trails or structures.

While there is no established specific time line for wildlife habitat projects on the CHMU, when and where opportunities are identified, management activities shall incorporate specific actions to protect or improve habitat. Typically, old field mowing is done on an annual to five-year schedule. Mast tree

release is accomplished on a regular basis as a component of commercial timber sales, by utilizing the services of contractors, and by coordinating volunteers.

### **C. Land Management Classification- Site Specific Management Actions**

While sections A and B above identify broad management goals, strategies, and actions for the CHMU, ANR recognizes that sometimes two goals can be partially incompatible. It is impossible-and inappropriate- to prioritize and maximize recreation, timber production, *and* wildlife habitat on every acre of land. Instead, ANR utilizes the resource assessments, public input, and local knowledge to decide where to focus certain efforts. Site-specific management decisions for the CHMU are guided by the ANR Land Management Classification system. Additionally, management of Camel's Hump State Park must also follow the legislatively mandated system of Use Districts defined by the Vermont Legislature in 1969 in Title 10, Chapter 77, Sections 2351-2354.

The Agency Land Classification system utilizes four management categories. These categories are:

- 1) Highly Sensitive Management
- 2) Special Management
- 3) General Management
- 4) Intensive Management

As part of the planning process the lands, resources, and facilities held by ANR are evaluated and assigned to the appropriate management category. Assignment of land management areas for each parcel is based on a thorough understanding of the resources identified and the application of land management standards. As time goes on, and additional information is gathered, the State will take an adaptive management approach with the potential for modifications or revisions to the Land Management Classification for the CHMU.

#### **1) Highly Sensitive Management Category:**

This is defined as an area with uncommon or outstanding biological, ecological, geological, scenic, cultural, or historic significance where protection of those resources is the primary consideration for management. Human activities and uses should not compromise the exceptional feature or features identified. Land within this category will have no timber management, salvage harvest, or active wildlife habitat management for non-RTE species. Active management will be limited to that necessary to 1) protect rare, threatened, and endangered species; 2) maintain or enhance the quality rank of significant natural communities; and 3) provide non-motorized, non-mechanized recreation opportunities.

Within the CHMU there are 7,490 acres classified as Highly Sensitive Management. This includes:

#### **1.1: Rare or exemplary natural communities or species (84 acres)**

A) Camel's Hump Summit (18 acres) – The Camel's Hump Summit is an iconic landmark and offers a unique alpine experience, and is thus deserving of a very high degree of protection. The Alpine Meadow and Subalpine Krummholz natural communities are both very rare in Vermont, and restricted to the tops of just the three highest mountains. The Alpine Meadow hosts numerous rare, threatened and endangered plants, many of which are more commonly found in arctic tundra hundreds of miles further north. The Boreal Acidic Cliff community found just to

the south of the summit is a designated cliff reserve. While it is essential to protect the resources found here, still, it is important to recognize that recreational use can be compatible. The Camel's Hump Summit is a highly-visited area with over 16,000 people a year signing in at trail registers, most with the goal of reaching the top. Many more visitors do not take the time to sign in. Damage to the alpine zone due to the high visitation is a real concern. The balancing of resource protection with recreational interests is of utmost concern here.

*Management Actions:*

- *Confine use to designated trails and area of bare rock on summit.*
- *Continue GMC seasonal caretaker presence on summit.* The seasonal caretaker can be found almost daily on the summit in the summer months and regularly interacts with visitors and reinforces resource protection.
- *Continue with closure of north summit area to visitors.* Closure is identified by wooden signs.
- *Compile alpine area research and consider experimental approaches to small areas to retain and restore alpine vegetation.*
- *Continue research to characterize and document summit area flora and fauna.*
- *This area is designated as Cliff Reserve per FPR policy, with a goal of maintaining species and ecological functions undisturbed by recreational climbing.*
- *Recreational rock and ice climbing is not allowed on these cliffs.*

B) Cliffs adjacent to Appalachian Gap (64 acres)- These cliffs provide continuity and connection with adjacent ridges of montane spruce-fir and the spruce-fir-yellow birch natural communities. Three rare plants are located here. This area is very accessible as it lies adjacent to a parking area at Appalachian Gap. The Long Trail also traverses the cliff community. There is evidence that the cliffs are used by rock climbers. Due to the sensitivity of the area and the valued scenic resource, ANR was pleased that in accordance with stipulations of their license agreement, American Tower decided to remove the telecommunications tower from the high point of Route 17. This area was restored in the summer of 2014.

*Management Actions:*

- *Monitor cliff communities for impacts from rock climbing activities.*
- *Consider designation as a cliff reserve should monitoring of natural communities deem it necessary. Such a designation would entail a prohibition on rock climbing.*
- *Work with CRAG-VT on education and outreach to climbers emphasizing the sensitivity of cliff communities and the importance of low impact climbing practices.*

C) Rare plant located on the Stevens Block of CHSF (~2 acres) Jacob's Ladder (*Polemonium vanbruntiae*) is found in an opening.

*Management Actions:*

- *Monitor the population to detect any changes in abundance and health of the plant species.*
- *Develop strategies to enhance and maintain this population.*

### 1.7: Exceptional water resources (213 acres)

D) Beaver maintained wetland complexes outside of the defined Natural Area (196 acres)- There are at least seven beaver complexes located outside the Natural Area (see 1.8, below). Beaver wetlands are the only open water features in the uplands of the CHMU and are thus critically important habitat for a variety of wildlife species.

#### *Management Actions:*

- *Prohibit new trail development, unless new trail reduces impact from existing or unregulated use.*
- *Manage for riparian functions and values in a minimum 100' zone around all wetland areas.*
- *Explore opportunities to relocate existing trails to avoid beaver wetlands.*

E) Riparian Management Zone (100') along the Winooski River (17 acres) - In four separate spots, ownership extends all the way to the Winooski River. These areas of floodplain forest are limited in extent, but very important for flood attenuation, wildlife habitat, and many other riparian functions. In one area, adjacent to agricultural fields, the Long Trail has been relocated and briefly crosses into the Winooski River Corridor and Riparian Management Zone. The Winooski River RMZ will be managed in accordance with guidance provided in the *Riparian Management Guidelines for ANR Lands*. The exception to this is a small portion of the 92-acre agricultural license that uses the extreme outer edge of the RMZ (see LMC 2.8L).

#### *Management Actions:*

- *Utilize low-impact trail maintenance techniques*
- *Avoid permanent trail infrastructure in accordance with consultation from DEC Watershed Management Division.*
- *Respond appropriately to changes in flood regimes or sediment impacts from trail.*
- *Plant trees to add functionality as riparian habitat and floodplain forest.*
- *Monitor for the existence and proliferation of invasive plant species as these areas are likely to be entry points for various invasive plants including knotweed.*

1.8: *Natural Area and the Ecological Use District* (6,697 acres). This land management classification consists of two separate, but overlapping land designations.

I. The Camel's Hump Ecological Use District was created through Vermont Statute and defined by Title 10, Chapter 77, Section 2353. This Use District includes all land above 2500' in elevation and extends down to 900' elevation in the Gleason Brook Drainage. This area was designated in order to protect rare plants, preserve natural habitats and to maintain the wilderness feel.

II. The Camel's Hump Natural Area consists of all lands above 2800' elevation. Natural Area designation is defined by Vermont Statute in Title 10, Chapter 83, Section 2607. Natural Areas are lands that have retained their "wilderness" character or have rare or vanishing species of flora or fauna. These areas may include unique ecological, geological, scenic, and recreational features.

Because these two designations are similar in nature, they have been combined into one land management classification

F) Camel's Hump and Bald Hill Summit Ridge (1672 acres)- As noted above in LMC 1.1A, The Camel's Hump Summit is a highly visited area with unique geological and ecological features. The Camel's Hump and Bald Hill Summit Ridge is traversed by several trails leading to the summit and has a relatively high trail density. The high visitation of this particular area is the reason that it is not lumped in with the rest of the Natural Area and Ecological Use District (see LMC 1.8G below) While solitude is difficult to find on the summit ridge, maintaining the character of the area is a priority. While it is essential to protect the resources found here, still, it is important to recognize that recreational use can be compatible.

*Management Actions:*

- *Continue GMC seasonal caretaker presence.*
- *Continue to prohibit primitive camping.*
- *Monitor the use levels, extent of, and impacts from unauthorized glades. Work with Vermont Backcountry Alliance to raise awareness of the backcountry ethic.*
- *Consider proposals for ongoing maintenance of existing glades and the addition of new glades.* The Bald Hill area is popular with backcountry skiers. Many areas are already home to glades that have been in existence for some time. ANR recognizes the popularity of this emerging sport and believes that this use could be sustainable if glades were officially designated and managed in cooperation with FPR and the Catamount Trail/Vermont Backcountry Alliance. The health of the alpine forest, integrity of the forest research area, and the implications of management on Act 250 jurisdiction will all be important considerations when reviewing a proposal for designating and managing new or existing glades.
- *Continue to strengthen protection and education efforts focused on the health of the alpine zone.* Ever expanding visitor numbers poses a concern to the health of the summit ridge and the summit itself. ANR will work with GMC to implement creative solutions aimed at minimizing visitor impacts to the alpine zone.
- *Designate the Camel's Hump Challenge Cross Country Ski Trail.* The trail circumnavigates Camel's Hump and has been used for a special fundraising event once a year for over twenty years. The trail will now be marked and open all winter for use. A portion of this trail may also be co-incident with a re-routed section of the Catamount Trail. The bulk of the newly designated trail will traverse land management classifications 1.8F, however it will also traverse portions of 1.8G, 1.9H and 2.5J. Recreational use is in high demand in this part of the CHMU and proactive management should help it develop in a sustainable way. New recreational uses are consistent with both the Natural Area designation and the Ecological Use District. Non-motorized winter use will cause negligible site disturbance.
- *Consider re-opening the old Callahan Trail.* See LMC 2.5J. This was one of the first trails built on Camel's Hump, but was closed due to severe erosion the late 1970s. With minor relocations and trail tread repairs, erosion issues could be significantly mitigated. The trail would tie in with the Monroe Trail below the cliffs below the Alpine Trail. This trail would provide the opportunity for a loop hike and an alternate route to the heavily used Monroe trail.

G) Cliff Reserve within the Natural Area (391 acres)- This area shares nearly all of the same characteristics as LMC 1.8F. The distinguishing feature is a set of Boreal Acidic Cliffs that are of high ecological quality and mostly undisturbed by human activities. In contrast to other large cliffs in the vicinity (such as those in Bolton Notch or on Bone Mountain) which are frequented by rock climbers, these sizeable examples in an intact landscape and with little history of climbing use are notable. Several, particularly the summit cliff (see LMC 1.1A), support significant populations of rare plant species. Maintaining the ecological quality of these cliffs and limiting human disturbance provides an opportunity to protect all the associated species, habitats, and processes and functions of the natural community, including those that are not well understood.

*Management Actions:*

- *This area is designated as Cliff Reserve per FPR policy, with a goal of maintaining species and ecological functions undisturbed by recreational climbing.*
- *Recreational rock and ice climbing is not allowed on these cliffs.*
- *Continue GMC seasonal caretaker presence.*
- *Continue to prohibit primitive camping.*
- *Monitor the use levels, extent of, and impacts from unauthorized glades. Work with Vermont Backcountry Alliance to raise awareness of the backcountry ethic.*
- *Consider proposals for ongoing maintenance of existing glades and the addition of new glades. See LMC 1.8F for details.*
- *Continue to strengthen protection and education efforts focused on the health of the alpine zone. Ever expanding visitor numbers poses a concern to the health of the summit ridge and the summit itself. ANR will work with GMC to implement creative solutions aimed at minimizing visitor impacts to the alpine zone.*
- *Designate the Camel's Hump Challenge Cross Country Ski Trail. See LMC 1.8F for details.*
- *Consider re-opening the old Callahan Trail. See LMC 2.5J. This was one of the first trails built on Camel's Hump, but was closed due to severe erosion the late 1970s. With minor relocations and trail tread repairs, erosion issues could be significantly mitigated. The trail would tie in with the Monroe Trail below the cliffs below the Alpine Trail. This trail would provide the opportunity for a loop hike and an alternate route to the heavily used Monroe trail.*

H) Other Parts of the Natural Area and Ecological Use District (4634 acres) - These high elevation areas (>2500') and the greater part of the Gleason Brook Drainage are relatively remote and largely trail-less. They range in size from 2 acres to over 1600 acres. While the Long Trail traverses some of these areas, these are places where one is more likely to find solitude.

*Management Actions:*

- *Continue GMC seasonal caretaker presence.*
- *Prohibit new trail development, unless new trail reduces impact from existing or unregulated use. The only exception to this would be the possibility that a small portion of the Long Trail reroute will traverse the extreme lower edges of the Gleason Brook drainage. This re-route is further described in LMC 3.0A.*
- *Continue to prohibit primitive camping.*

### 1.9: Research Natural Area (495 acres)

l) Hub Vogelmann Research Natural Area (495 acres)- This area is within the Natural Area or Ecological Use District (see 1.8 above) and *also* part of the designated forest research area. This research area has been in continuous use since 1962 for critical forest research primarily related to acid deposition and forest dynamics.

#### *Management Actions:*

- *Continue to prohibit primitive camping.*
- *Designate the Camel's Hump Challenge Cross Country Ski Trail.* See LMC 1.8F for details.
- *Relocate the Catamount Trail.* See LMC 2.6K for details.
- *Maintain conditions for ongoing and future forest research in a natural setting with reduced or little human disturbance.*
- *Monitor the use levels, extent of, and impacts from unauthorized glades. Work with Vermont Backcountry Alliance to raise awareness of the backcountry ethic.*
- *Consider proposals for ongoing maintenance of existing glades and the addition of new glades.* The Bald Hill area is popular with backcountry skiers. Many areas are already home to glades that have been in existence for some time. ANR recognizes the popularity of this emerging sport and believes that this use could be sustainable if glades were officially designated and managed in cooperation with FPR and the Catamount Trail/Vermont Backcountry Alliance. The health of the alpine forest, integrity of the forest research area, and the implications of management on Act 250 jurisdiction will all be important considerations when reviewing a proposal for designating and managing new or existing glades.

### **2) Special Management Category:**

An area with unique or special resources where protection and/or enhancement of those resources is an important consideration for management. These areas do not require the same level of protection given to highly sensitive areas and may be intensively managed for specific purposes. However, timber harvesting, wildlife habitat management, roads, and recreational activities should not compromise the unique or special resources identified. Timber harvesting and wildlife habitat management as well as recreation are considered to be complimentary uses within this classification to the extent that they do not negatively impact special features.

Within the CHMU there are 10,553 acres in the Special Management classification. This includes:

#### 2.2: Critical Plant and Wildlife Habitat (1475 acres)

- A.) Beech Mast Production Areas (397 acres) - These areas have been identified as places where American beech makes up a significant portion of the tree canopy and show evidence of feeding activity by bears. Beech nuts are a very important food source for a variety of wildlife species. While beech trees are present throughout the forests of the Camel's Hump Management Unit, this land classification applies only to identified "Beech Mast Production Areas." Principles of beech management will be incorporated into all aspects of forest management; however, these areas are unique in the sheer density of beech and the importance of the food source.

*Management Actions:*

- *Within beech stands that are scheduled for timber management, follow the VT ANR Management Guidelines for Optimizing Mast Yields in Beech Mast Production Areas. Examples of key management strategies include a) identifying disease-resistant, and mast-producing trees and protecting these individuals, b) application of uneven-aged management in the mast stand and 200 foot buffer.*
- *Limit or restrict vehicle access to the mast stand during critical feeding periods.*
- *Discourage new trail development that would lead to increased use during critical feeding periods, unless new trail reduces impact from existing or unregulated use.*

B.) Deer Wintering Area (140 acres) - Due to the elevation, there is limited deer wintering habitat on the CHMU. Those areas that do exist need to be carefully managed to continue providing habitat that is critical to deer at this latitude. Deer wintering areas are those in which softwood trees are the major component of the overstory, but must lie at an elevation that is favorable to overwintering deer.

*Management Actions:*

- *Within deer wintering areas that are scheduled for treatment, comply with Management Guide for Deer Wintering Areas in Vermont (VDFPR and VDFW 1990). Examples of key management strategies are a) perpetuate softwood cover, b) maintain deer mobility and access, and c) provide preferred, accessible browse.*
- *Discourage new trail development that would lead to increased use during the winter unless new trail reduces impact from existing or unregulated use.*
- *Explore opportunities to relocate existing winter trails to avoid deer wintering areas, specifically on the Catamount Trail between Camel's Hump Road and Stagecoach road.*

C.) Old Fields/Maintained Openings (28 acres)- Old fields and maintained openings provide valuable landscape diversity and critical habitats for certain early successional wildlife species. These are predominantly located near existing roads and at lower elevations on the CHMU.

*Management Actions:*

- *Maintain openings by mowing on a 1-5 year cycle.*
- *Delay mowing of maintained fields until after August 15 to provide habitat for birds, as well as wildflowers that support bees and other pollinator species.*

D.) Soft mast Production Areas (23 acres)- Soft mast production areas are important for their landscape diversity and for their supply of food for a diversity of wildlife. The soft mast production areas represented in this category are all areas where old apple trees are

growing. Soft mast-producing trees appear throughout the forest and include cherry and serviceberry, however this category consists only of areas that have a high density of apple trees. Principles of mast production will be incorporated throughout the CHMU.

*Management Actions:*

- *Release apple trees by cutting competing vegetation thereby allowing more light to reach the apple trees*
- *Prune apple trees to increase mast production*

E.) Oak Stands (81 acres)- Oak forests are relatively uncommon in the CHMU. These stands represent a unique habitat type and wildlife food source. Additionally, as the climate warms in coming decades, oaks are expected to be a more competitive species, and as such, these areas could serve as an important seed source in the future. While oak trees may be present at low densities throughout the forests of the CHMU, this land classification applies only to identified oak stands. Maintaining oak as a component will be of importance throughout the CHMU when present; however, these areas are unique in the sheer density of oak and the importance of the food source.

*Management Actions:*

- *Within red oak stands scheduled for treatment, maintain and enhance the red oak component.*
- *Discourage new trail development, unless new trail reduces impact from existing or unregulated use.*

F.) Alder Stand (~3 acres)- Alder stands represent an important and unique opportunity to create habitat for woodcock. Woodcock use alder stands for feeding cover and nesting habitat. There is only one alder stand on the unit.

*Management Actions:*

- *When possible, maintain alder cover for woodcock habitat by cutting on a 10-20 year cycle.*

G.) Robbins Mountain Interior Forest Habitat (498 acres)- Management of this area is focused on providing a diversity of wildlife habitats that range from early successional forest characteristics to mature late successional forest.

*Management Actions:*

- *Manage for forest patch openings that range in size from one half acre to five acres to develop a mixed age structure and vertical diversity throughout the forest. Where feasible, locate patches larger than 1 acre in areas that are currently even-aged forest.*
- *Provide a soft mast component available to a variety of wildlife species during the late summer to early fall period.*

- *Manage areas for late successional forest characteristics that include high residual basal areas, coarse woody debris, and large snags.*
- *Allow for dispersed wildlife based pedestrian recreation.*
- *Manage vegetation to optimize wildlife habitat for a variety of common and target wildlife species.*

#### **2.4: Wildlife and Forestry Demonstration Areas (65 acres)**

H.) Steven's Block Demonstration Area (65 acres) - Management of this area has been a collaboration between FPR and the Orvis Volunteer Group. This active group of volunteers has a long history of working with FPR staff and maintains a regular presence on the Stevens Block of Camel's Hump State Forest through implementing a suite of projects which maintain and enhance critical wildlife habitats. Habitat projects are coordinated by a District Forester and directed by an annual work plan to accomplish desired outcomes.

##### *Management Actions:*

- *Construct a new parking area, with approximately 5 vehicle capacity.* At present parking is extremely limited, and does not adequately accommodate the public.
- *Maintain the historic orchard and areas with concentrated apple trees through continued release and pruning to encourage soft mast production.*
- *Increase the percentage of early successional habitat by implementing small patch clear cuts (<5 acres).* These treatments will ideally regenerate aspen for ruffed grouse habitat and provide hardwood browse for white-tailed deer, moose, and beaver.
- *Expand the overall softwood component.* Softwood trees provide winter cover and food for a variety of wildlife species, including white-tailed deer. Release of advanced regeneration of spruce, fir, hemlock, and pine, and subsequent control of hardwood competition will help bolster the softwood component.
- *Recruit and retain soft and hard mast producing species.* Red oak, serviceberry, black cherry and others provide a valuable food source for wildlife and will benefit from release from competing hardwood.
- *Maintain grassland and old field habitat types through regular mowing and/or brush-hogging.*
- *Establish supplemental high value herbaceous food plots in areas being maintain as old field or grassland.*

#### **2.5: Special Protection Areas (designated for protection by deed restrictions or conservation easements). (8,552 acres)**

I.) Phen Basin Ecological Protection Zone (1796 acres)- The Vermont Housing and Conservation Board (VHCB) and Vermont Land Trust (VLT) co-hold an easement on the Phen Basin Block of Camel's Hump State Park. The easement has specific requirements and restrictions as they relate to a part of the property known as the Ecological Protection Zone (EPZ). A summary of the easement for Phen Basin can be found in Appendix B, Part 2. The purpose of the EPZ is to foster the conservation of wildlife, habitats, forestry values, public recreational opportunities, and scenic resources. Wildlife habitat management is meant to focus on maintaining or enhancing biological diversity and old growth forest. The easement precludes

a number of different activities, including timber harvesting for solely commercial reasons. The easement does permit a variety of recreational activities, and this area is traversed by both mountain bike trails and snowmobile trails, both of which are permitted under the easement.

*Management Actions:*

- *Assess forest condition and old growth status.*
- *Identify opportunities to enhance late successional forest characteristics.*
- *Consider expansion of mountain bike trails in cooperation with the Mad River Riders-the local mountain bike club.* New trails would be in the vicinity of the already existing trail network. These new trails would add to the trail base of entry-level and intermediate trails, which are reportedly lacking on state land and in the Mad River Valley in general. Some preliminary scouting has been done, but routes will need to be carefully planned to comply with stipulations of the easement and to guarantee appropriate buffers for the myriad sensitive ecological features located in Phen Basin. Additional mountain bike trails would also traverse land classification 3.0.
- *Collaborate with VHCB and VLT to meet the requirements of the easement.*

J.) Timber Management and Wildlife Area (6756 acres) - These areas lay within the legislatively designated *Timber Management and Wildlife Area*, defined as all lands below the *Ecological Use District* (1.8) down to 1800' elevation. This area is meant to be a buffer to the Natural Area, with somewhat reduced activities compared to the General Management Category areas. Purposes of this area include management for forest products and wildlife habitat, protection of the Natural Area, and to preserve the aesthetic values of the region. Allowed uses also include hunting, hiking, x-country skiing, and nature appreciation. While this area is eligible for timber harvests, difficult terrain, lower quality growing sites, and reduced timber quality have precluded a history of logging and associated access roads. For that reason, some of these areas are the most remote on the entire CHMU. Still others are home to hiking, snowmobiling, and x-country ski trails.

*Management Actions:*

- *Utilize diverse types of forest management in order to create structurally diverse wildlife habitat*
- *Consider re-opening the old Callahan Trail.* This was one of the first trails built on Camel's Hump, but was closed due to severe erosion the late 1970s. With minor relocations and trail tread repairs, erosion issues could be significantly mitigated. The trail would tie in with the Monroe Trail below the cliffs below the Alpine Trail. This trail would provide the opportunity for a loop hike and an alternate route to the heavily used Monroe trail. A portion of the trail also traverses LMC 1.8F and 1.8G.
- *Designate the Camel's Hump Challenge Cross Country Ski Trail.* See LMC1.8F for details.
- *Consider expansion of cross country ski trails originating at the Camel's Hump Nordic Ski Area (CHNSA).* CHNSA is a not-for-profit organization that maintains ski trails in the Honey Hollow and Bald Hill areas. They have expressed interest in expanding their trail network further onto Camel's Hump Management Unit. Such expansion could be appropriate given the presence of ski trails already in the area. Such a use

would comply with the legislative designation of the “Timber Management and Wildlife Area.” At this point, the proposal is conceptual. Actual siting of trails on the ground will need to take into account site details. In evaluating subsequent proposals, the DST will carefully consider the potential impacts of increased access to the adjacent LMCs including 1.8, 1.9, 2.2, and 2.6. Furthermore, groomed trails would require a higher level of scrutiny given the increased access groomed trails afford skiers.

## 2.6: Research Monitoring Areas (336 acres)

- K.) Hub Vogelmann Research Area (336 acres)- This area represents the portion of the designated forest research area not within the Natural Area or Ecological Use District (see 1.9H for the balance of the Research Area). This research area has been in continuous use since 1962 for critical forest research primarily related to acid deposition and forest dynamics.

### *Management Actions:*

- *Continue to prohibit primitive camping.*
- *Maintain conditions for ongoing and future forest research in a natural setting with reduced or little human disturbance.*
- *Monitor the use levels, extent of, and impacts from unauthorized glades. Work with Vermont Backcountry Alliance to raise awareness of the backcountry ethic.*
- *Consider proposals for ongoing maintenance of existing glades and the addition of new glades.* The Bald Hill area is popular with backcountry skiers. Many areas are already home to glades that have been in existence for some time. ANR recognizes the popularity of this emerging sport and believes that this use could be sustainable if glades were officially designated and managed in cooperation with FPR and the Catamount Trail/Vermont Backcountry Alliance. The health of the alpine forest, integrity of the forest research area, and the implications of management on Act 250 jurisdiction will all be important considerations when reviewing a proposal for designating and managing new or existing glades.
- *Relocate the Catamount Trail.* The CTA has proposed to relocate a section of the CT in the Huntington area off of private land and onto adjoining state land. Some scouting has been done for options for a route. The re-route will utilize existing skid trails whenever possible and will traverse LMC 3.0A, 2.6K, and 1.9I before joining the Camel’s Hump Challenge Trail and then re-joining the existing Catamount Trail. While a good portion of the re-location is in the designated Research Area, we anticipate that non-motorized winter use will cause negligible site disturbance.

## 2.8: Agricultural Land (126 acres)

- L.) Winooski Riverside Agricultural Lease (92 acres)- This area is located between the Duxbury Road and the Winooski River and was acquired by the state in 1991 along with the rest of the “Lafreniere Parcel”. This land has been farmed for a very long time and continued agricultural use is required by the deed. In 2015 the Long Trail was relocated off Duxbury Road and onto the agricultural land (as well as a small portion of LMC 1.7E). For years GMC has been collaborating with FPR and other partners to relocate the Long Trail in the

Winooski River Valley. This section represents a small portion of the larger effort and allows the trail to avoid nearly a mile of road-walk on the Duxbury Road. The newly designated trail utilizes portions of the existing Riverside Trail. The trail largely sticks to the inside and outside edges of the agricultural lease, adjacent to the existing fence. The trail fords Preston brook and a bypass of the ford is available for use during high water periods. The route for the relocation was decided upon through consultation with GMC, the licensee, and DEC specialists. Other potential routes were considered and ultimately, this was identified as the best route. This re-route creates a unique trail experience as it traverses agricultural land, an under-represented land use on the Long Trail.

*Management Actions:*

- *Continue to manage as agricultural lands with a focus on sustainable, low-impact farming.*
- *Arrange licenses with qualified farmers for use of these lands.*
- *Add educational signage along the Long Trail detailing the importance of the working landscape.*
- *Strategically plant trees to enhance shade for Long Trail hikers along field edge.*
- *Explore opportunities to add functionality as floodplain forest while still maintaining a land base for a viable agricultural operation.* This area is bisected by Preston Brook, a very active headwater stream that has experienced two severe floods in the course of several years- 2011 and 2013. There may be a way to add flood resiliency to the agricultural land and minimize sediment discharge to the Winooski River from Preston Brook. FPR will consult with DEC and the licensee before making any changes that would affect the agricultural values of the land.

M.) Howe Block Sugarbush (34 acres) - This area has been sugared since 1979 and consists of approximately 1700 taps.

- *Arrange license with qualified sugarmakers for use of these lands.*

**3) General Management Category:**

An area where the dominant uses are sustainable timber harvesting, wildlife habitat management, trail networks, dispersed recreation, and other general land uses. In these areas a primary management consideration is minimizing conflict between activities as well as with lands categorized as more sensitive where they are adjacent to a general use area. In addition, more sensitive resources that occur within these areas may require special attention, such as vernal pools or seeps.

Within the CHMU there are 7,961 acres within the General Management category.

3.0: Multiple Use District. These areas correspond with the legislatively designated “multiple use area”. This area is similar to LMC 2.5J but does not have an elevation threshold. These areas are not *defined* by their ecologically sensitive features or important wildlife habitat. At the same time, small areas of ecologically sensitive features and critical wildlife habitat are undoubtedly embedded in this category, and will be managed accordingly. The majority of the timber management on the CHMU will take place in this LMC. (7,805 acres)

- A.) Contiguous Portion of Multi Use Area (7492 acres)- This portion of LMC 3.0 constitutes the contiguous portion of the CHMU. It does not include the Howe Block of Camel's Hump State Forest or the Hospital Block of Camel's Hump State Park.

*Management Actions:*

- *Utilize strategies described in section IV.C- Vegetation Management to optimize production of forest products.*
- *Utilize strategies described in section IV.C. Wildlife Habitats Management to optimize habitat for a variety of general and target wildlife species.*
- *Utilize strategies described in section IV.C. Recreation Management- to optimize recreation opportunities.*
- *Re-locate Long Trail near the crossing of Gleason Brook to cross Duxbury Road in the vicinity of the Winooski River Access Area.* This re-route ties in with the larger efforts to re-route the Long Trail in the Winooski River Valley. This particular section will avoid approximately .8 miles of road walk along Duxbury Road, hopefully creating a safer and more enjoyable hiking experience. This re-route is still in the conceptual stage. A route has not yet been identified on the ground.
- *Relocate the Catamount Trail.* See LMC 2.6K for details.
- *Consider expansion of cross country ski trails originating at the Camel's Hump Nordic Ski Area (CHNSA).* See LMC 2.5J for details.
- *Enhance access to Phen Basin Block in North Fayston.* Currently the parking at the end of Bassett Hill Road in Fayston is on an old log landing, and is not readily accessible due to the poor road condition of the road leading to it. FPR would like to work with the town of Fayston to improve this section of town road, and the short section of road beyond the town road to the log landing, and gravel a portion of the log landing.
- *Consider proposals from qualified sugarmakers to license portions of the area for production of maple sap.* Preliminary scouting has shown four areas that could potentially be appropriate. These are in Honey Hollow Block in Bolton, the former Carse and Salvas Parcels in Huntington, and in Appalachian Gap Block in Buel's Gore.

- B.) Howe Block Multi-Use Area (303 acres)- The Howe Block of Camel's Hump State Forest is a popular mountain biking destination. It is located in Waitsfield and Fayston, and is a stand-alone piece of the State Forest.

*Management Actions:*

- *Continue to cooperate with the Mad River Riders to maintain the mountain bike trails to a high standard.*
- *Consider re-routes and potential additional trails.*
- *Utilize strategies described in section IV.C- Vegetation Management to optimize production of forest products.*
- *Utilize strategies described in section IV.C. Recreation Management- to optimize recreation opportunities.*

- C.) Hospital Block Multi Use Area (136 acres) - The Hospital Block of Camel's Hump State Park can be accessed from Hart Road in Duxbury. It is a stand-alone piece of Camel's Hump State Park that has had little active management since state acquisition.

*Management Action*

- *Convey parcel to the town of Duxbury for use as a town forest-* Given its location and size, FPR believes that the Hospital Block would provide a greater public benefit if it was owned and managed by the town of Duxbury as a municipal forest.

**4) Intensive Management Category:**

An area that is easily accessible and characterized by a high level of human activity and high intensity development on or adjacent to state land. Aesthetics and safety are the primary management considerations in these areas. However, more sensitive resources that occur within these areas may require special attention.

Within the CHMU there are 30 acres in the Intensive Management category.

*4.4: High use access parking areas (26 acres)*

*Management Actions:*

- *Continuing maintenance and upgrades to existing parking areas.* Periodically ANR will brush out around parking lots and remove hazard trees in close proximity. Ongoing maintenance includes periodic shaping, drainage, and gravel addition.
- *Consider options for improved human waste management as associated with the use of the more popular access points, such as the Monroe and Burrows trail heads.*
- *Remove parking area at Robbins Mountain WMA.* The existing parking area that is just south of the Chittenden Fish and Game Club entrance poses safety concerns related to the nearby shooting range. Other parking alternatives will be considered.

*4.6: Other Infrastructure (4 acres)* - The two gravel pits (Duxbury Road and Connally Road) have historically been valuable in helping ANR repair and maintain roads.

*Management Actions:*

- *Permanently close and stabilize the gravel pit on Duxbury Road-* This gravel pit has been used extensively in the past four years for repairing state park access roads as well as town roads in the aftermath of Tropical Storm Irene and again after the storms of July 2013. Because of its proximity to the Winooski River and the decreasing quality of the gravel FPR is in the process of stabilizing and re-vegetating the gravel pit.
- *Continue to extract small amounts of gravel from the Connally Road pit for use on state lands only.*

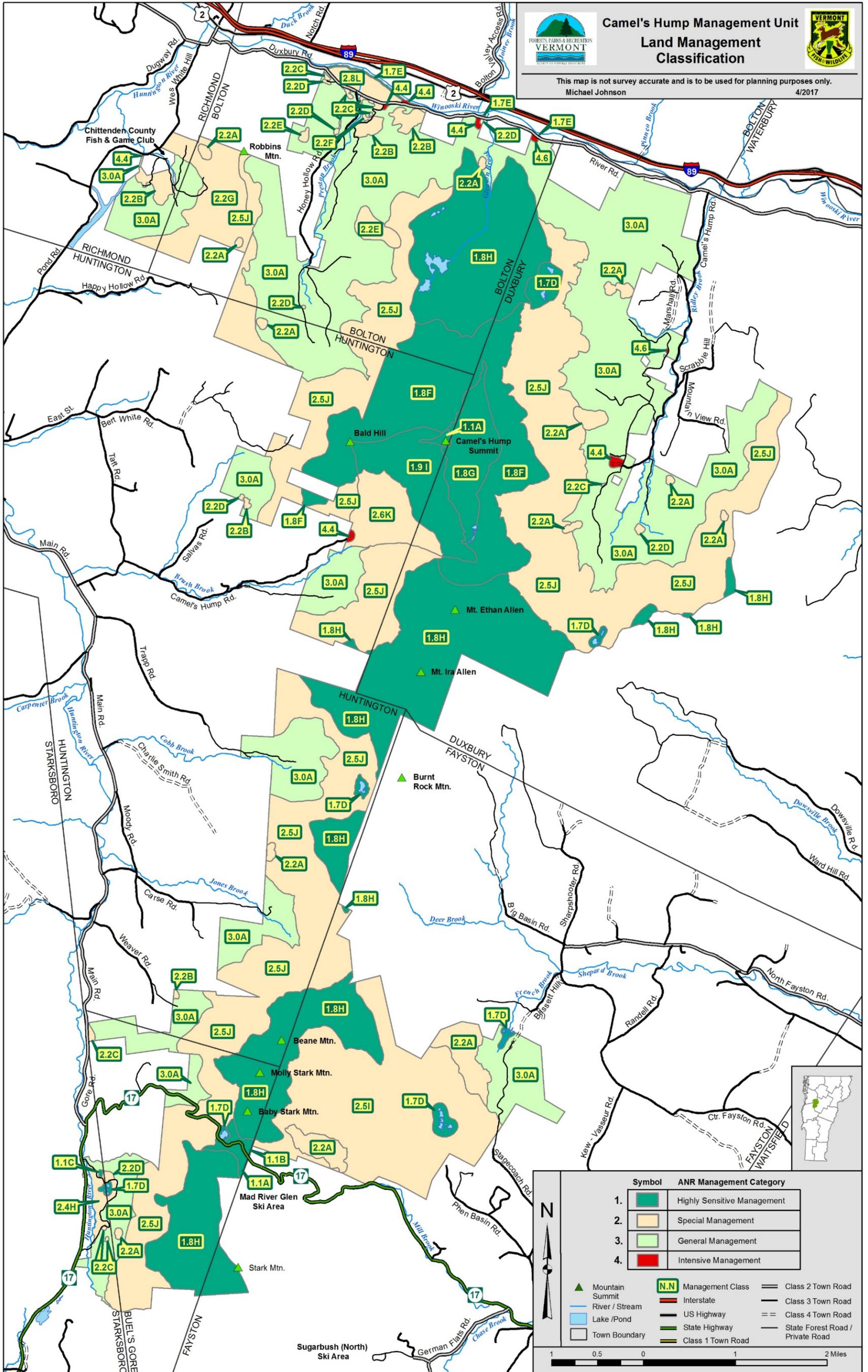


Figure 18- Land Management Classification Map

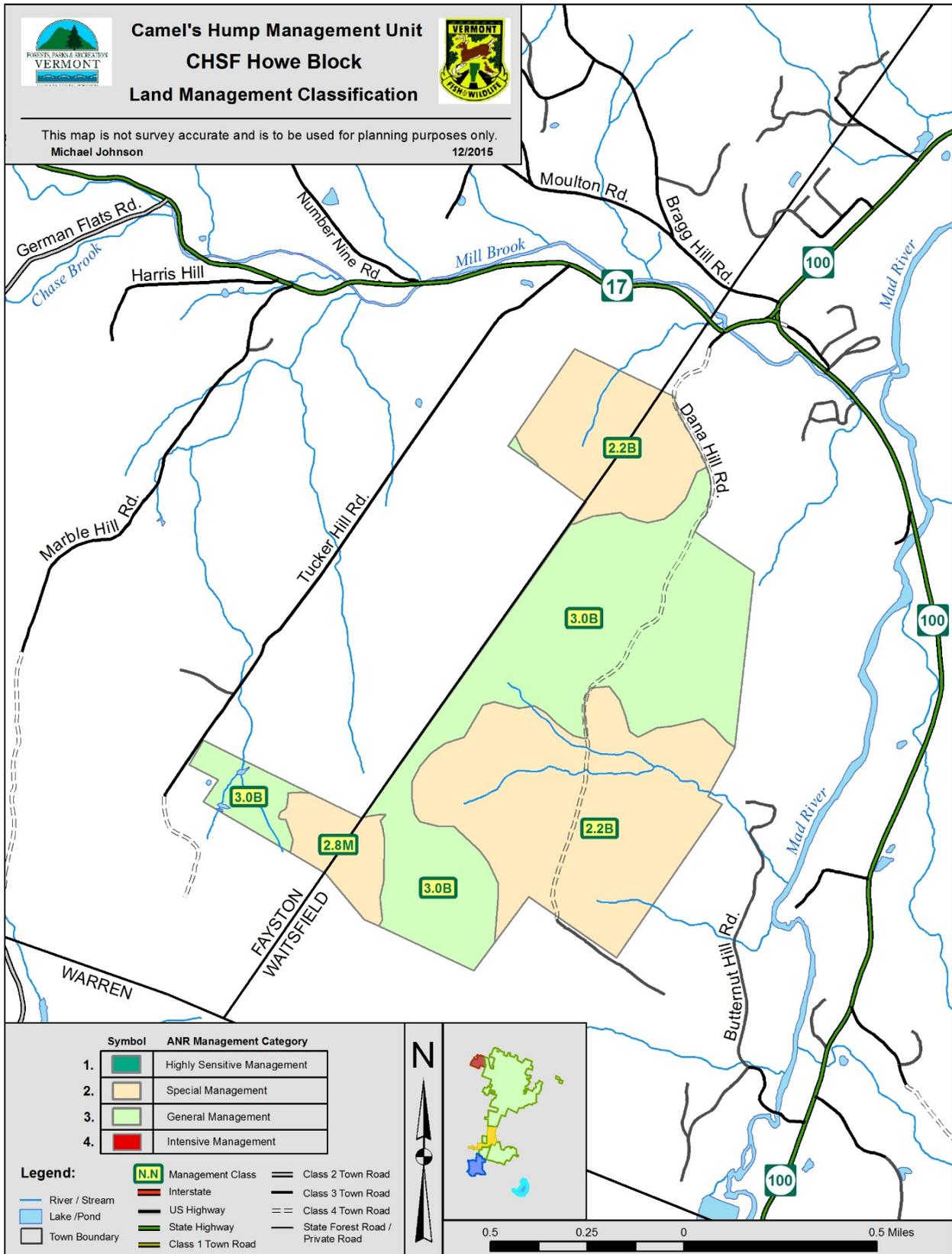


Figure 19- Land Management Classification, Howe Block Map

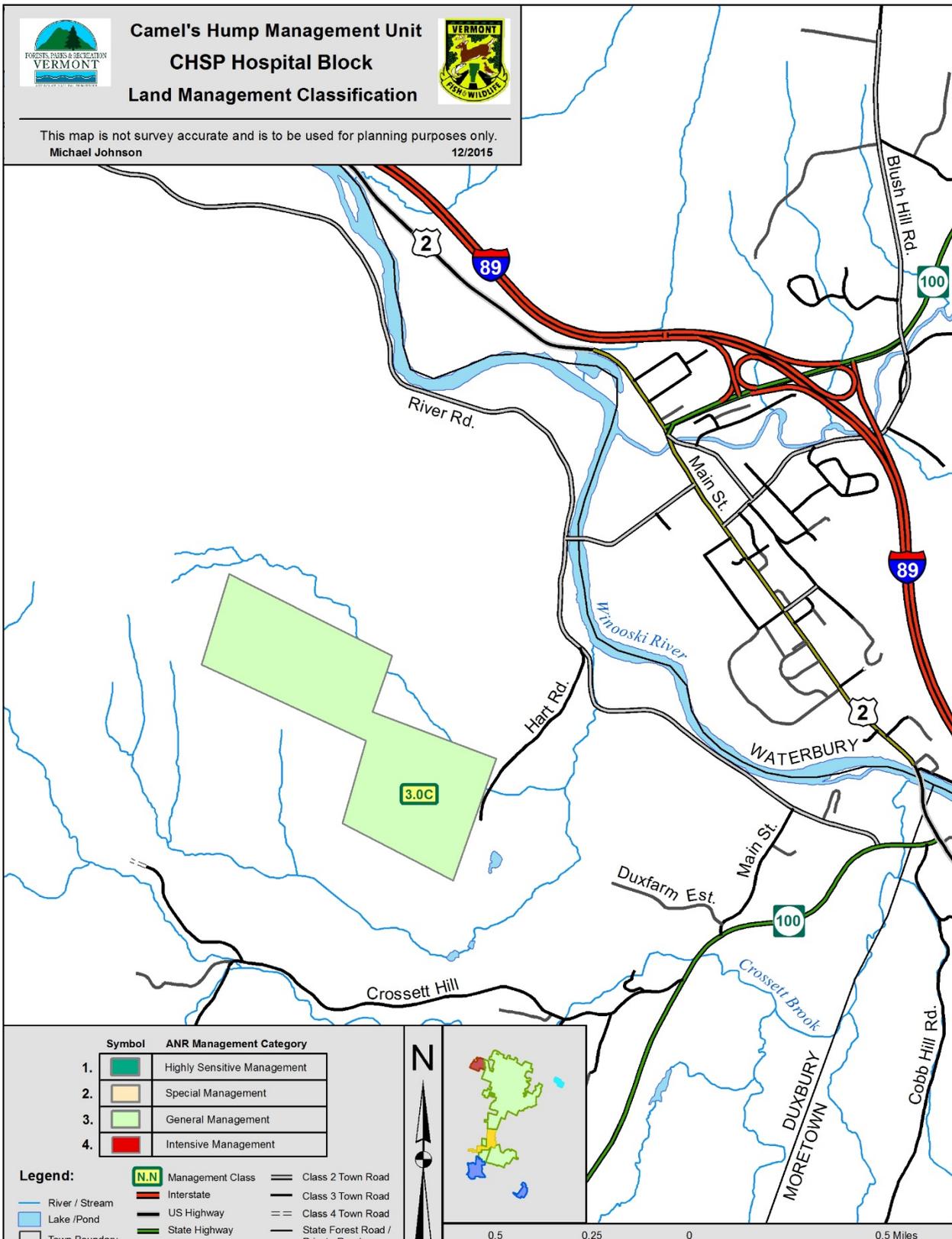


Figure 20- Land Management Classification, Hospital Block Map

## **D. Implementation Schedules**

Implementation of management actions identified in section B and C above is often carried out as opportunities arise and on an as-needed basis, or when particular financial or volunteer resources are available to ANR. Certain activities are conducted according to a flexible schedule. These include timber management and road maintenance. On the following pages are maps and charts that describe the proposed timber harvests and road projects for the coming 15-year period. The exact implementation schedule may need to be adjusted based on funding availability, extreme weather events, and other unforeseen factors.

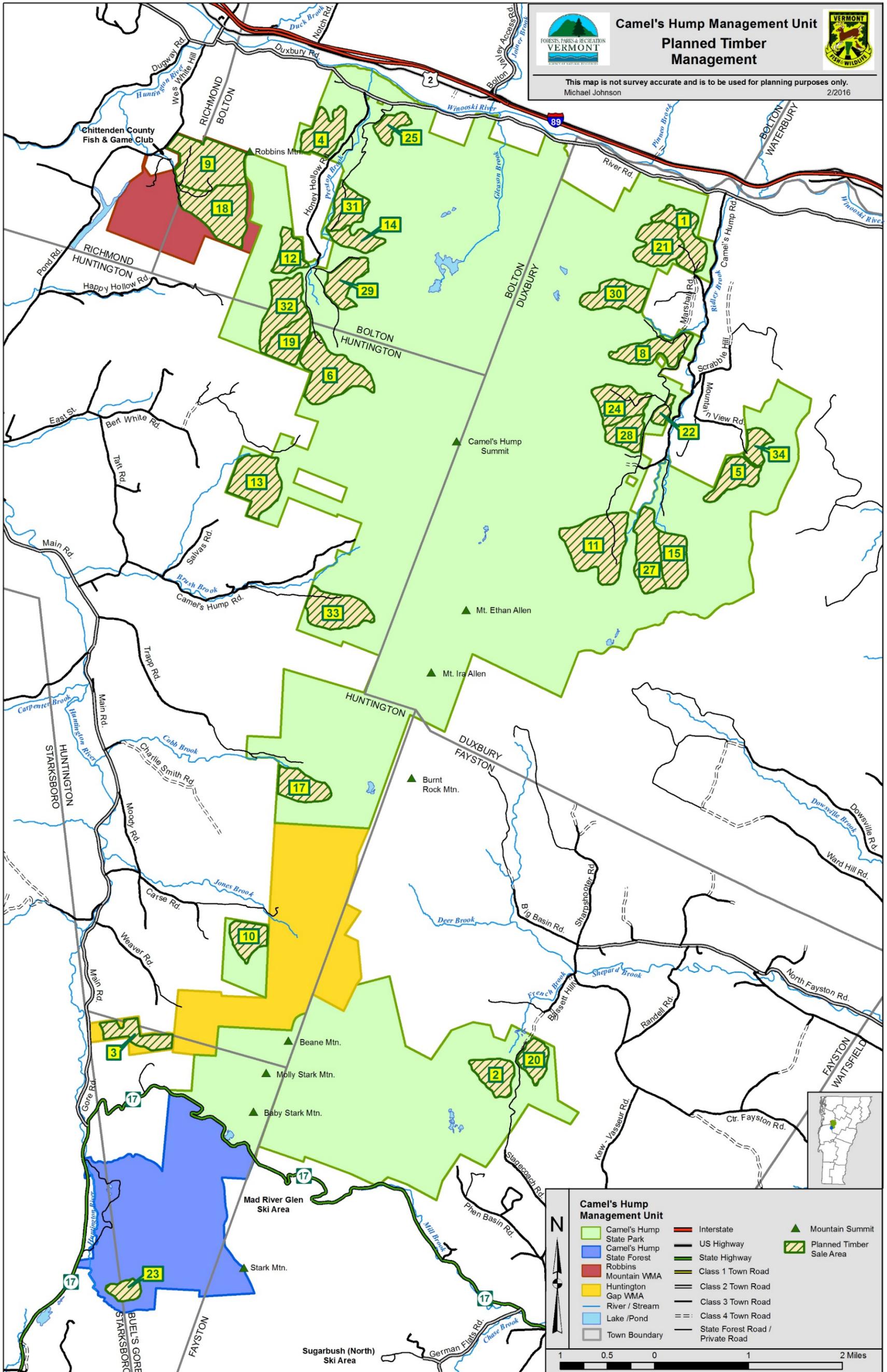


Figure 21- Planned Timber Management Map

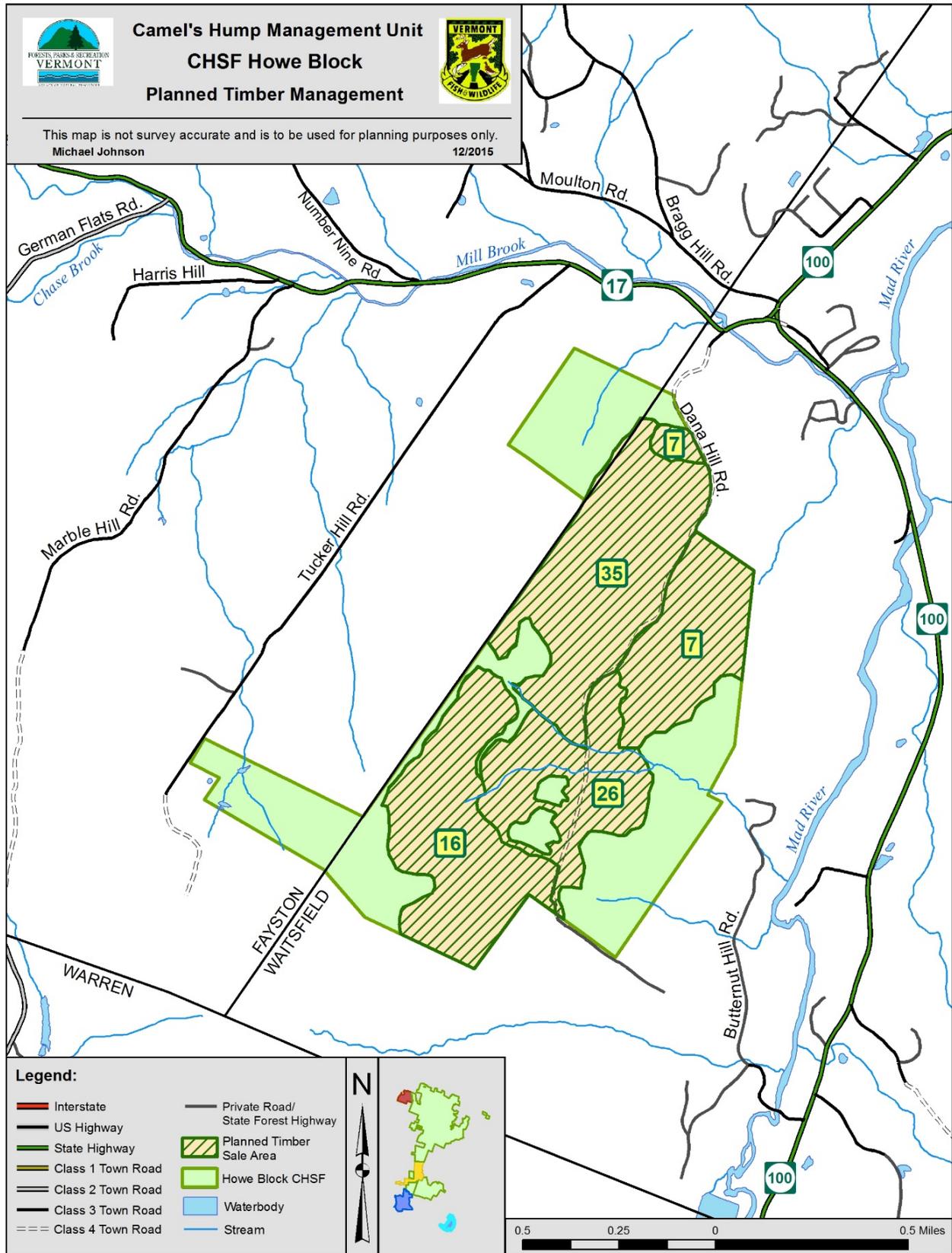


Figure 22- Planned Timber Management, Howe Block Map

**CAMEL'S HUMP MANAGEMENT UNIT**

**Timber Management Plan – 2016-2031**

#	Parcel	Block/Comp/ Stand(s)	Acres	Target Year	Yearly Acres	Treatment	Access Needs
1	CHSP (Duxbury)	1/1/1	115	2018		Group Selection	Open up road and landing
2	CHSP (Phen Basin)	7/1/1	86	2018	201	Overall thinning and softwood release	Improve road and landing
3	Hunt. Gap WMA	1/2/1,2,4	81	2019		Thinning and patches	Develop access and landing
4	CHSP (Honey Hollow)	2/7/2,3,5	107	2019	188	Overall thinning and patches	Improve road and develop landing
5	CHSP (Duxbury)	1/10/1,2,4,5	86	2020		Single Tree and Group Selection	Improve road and landing
6	CHSP (Honey Hollow)	2/4/1,2,3,4,5,7	201	2020		Single Tree and Group Selection	
7	CHSF (Howe)	2/2,3/4;1,2,3	87	2020	374	Thin plantations, NH stand-selection harvest and small patches	Summer logging
8	CHSP (Duxbury)	1/3/2,3,4,5,7,8	108	2021		Single Tree and Group Selection	Improve landings
9	Robbins Mt. WMA	1/1/1,2,3,4,5,6,11,12,13,14	226	2021	334	Thinning with patches	
10	CHSP (App. Gap)	6/2/1,2	76	2022		Single Tree and Group Selection	Determine and develop access
11	CHSP (Duxbury)	1/6/1,6, 1/7/1,2	231	2022	307	Single Tree and Group Selection	Replace bridge on truck road
12	CHSP (Honey Hollow)	2/6/1	68	2023		Single Tree and Group Selection	Develop road and landing
13	CHSP (Forest City)	4/4/1,2,3	166	2023	234	Thinning with patches/sugarbush	Develop new access road and landing
14	CHSP (Honey Hollow)	2/2/10,12,14	60	2024		Single Tree and Group Selection	Develop better landing
15	CHSP (Duxbury)	1/8/2,4,6	96	2024		Shelterwood – Even-age	Develop new access road and landing
16	CHSF (Howe)	2/1/1,4	124	2024	280	Selection harvest with small patches	Summer logging
17	CHSP (Cobb Brook)	5/1/3	94	2025		Single Tree and Group Selection	
18	Robbins Mt. WMA	1/1/7,8,9,10,15	209	2025	303	Thinning with patches	
19	CHSP (Honey Hollow)	2/4/1,2,3,4	96	2026		Single Tree and Group Selection	
20	CHSP (Phen Basin)	7/1/1,6,7	66	2026	162	Overall thinning with softwood release	Access road upgrade
21	CHSP (Duxbury)	1/1/1	121	2027		Overall thinning with small patches	
22	CHSP (Duxbury)	1/4/13,14	24	2027		Clear-cut and thinning of plantation	
23	CHSF (Stevens)	1/1/1,5	40	2027	185	Overall thinning with small patches	Establish access and landing
24	CHSP (Duxbury)	1/4/4,5,7,16	115	2028		Overall thinning with small patches	Upgrade road
25	CHSP (Honey Hollow)	2/1/2,3,7	46	2028		Softwood release and patches	
26	CHSF (Howe)	2/1,3/2,3;5,6,8	77	2028	238	Thinning in softwood plantations	Summer logging
27	CHSP (Duxbury)	1/8/2,3,4,6	136	2029		Single Tree and Group Selection	
28	CHSP (Duxbury)	1/4/4,5,7,16	73	2029	209	Single Tree and Group Selection	Upgrade road and landing
29	CHSP (Honey Hollow)	2/3/1,5,7	92	2030		Single Tree and Group Selection	
30	CHSP (Duxbury)	1/2/3	108	2030	200	Single Tree and Group Selection	
31	CHSP (Honey Hollow)	2/2/7,8,9	86	2031		Single Tree and Group Selection	
32	CHSP (Honey Hollow)	2/5/1,2,3	139	2031	225	Single Tree and Group Selection	
33	CHSP (Forest City)	4/1/1,2,3,6	143	2032		Shelterwood – Even-age	
34	CHSP (Duxbury)	1/10/1,2,3	47	2032		Uneven-age with patches	
35	CHSF (Howe)	2/2/1,3	134	2032	324	Selection harvest with small patches	Summer logging

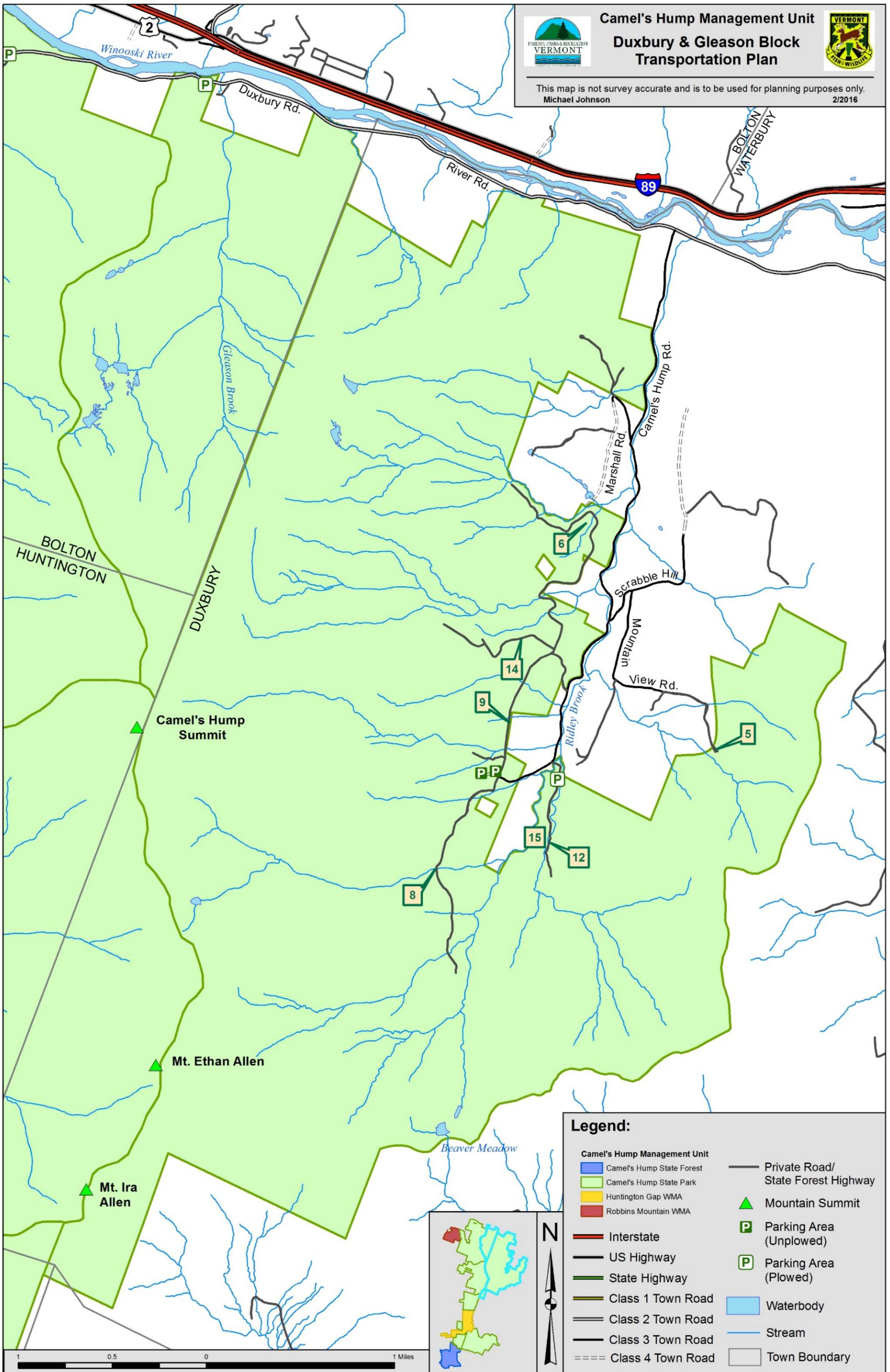


Figure 23- Transportation Plan, Duxbury & Gleason Blocks Map

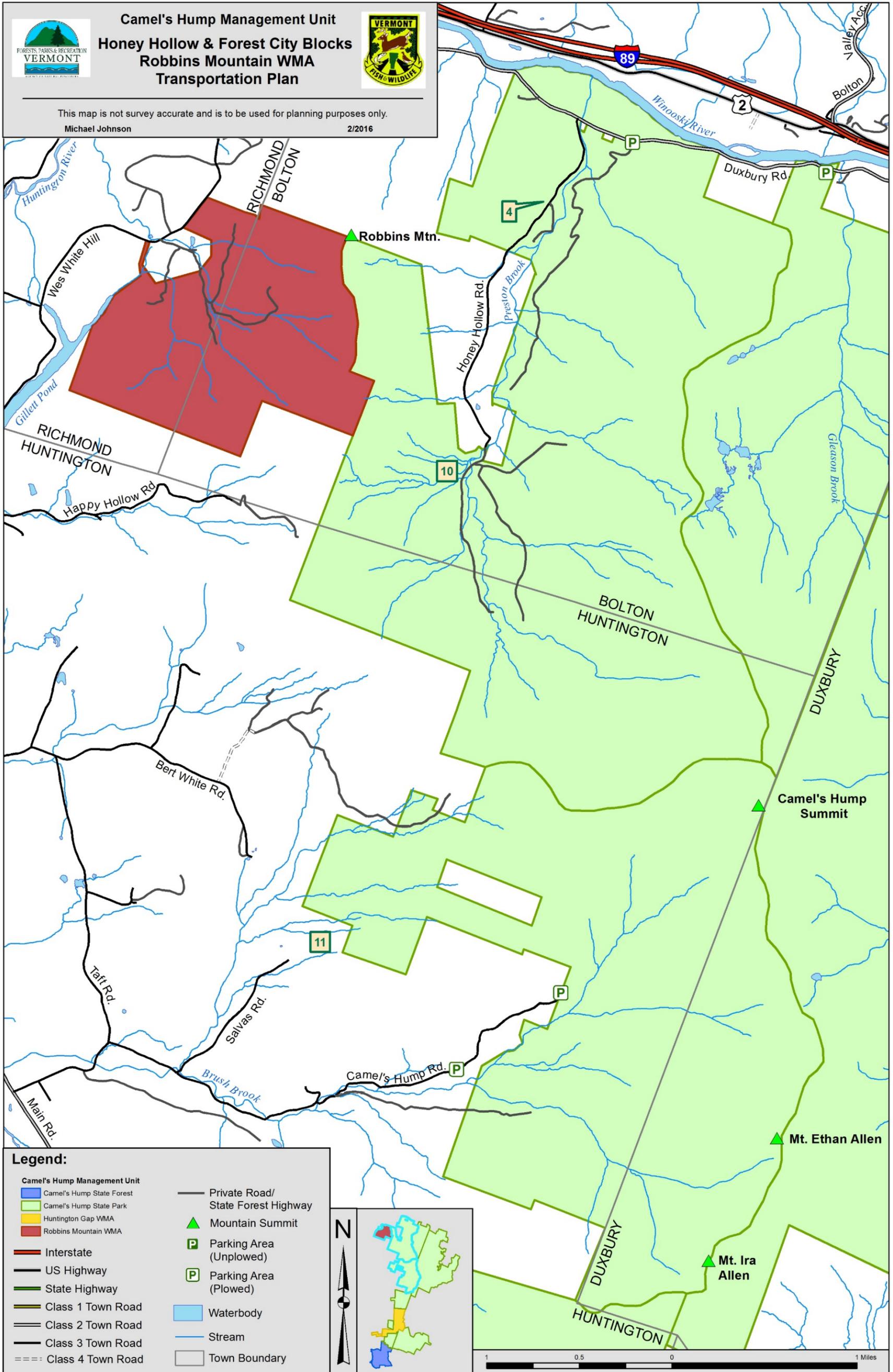


Figure 24- Transportation Plan, Honey Hollow & Forest City Blocks Map

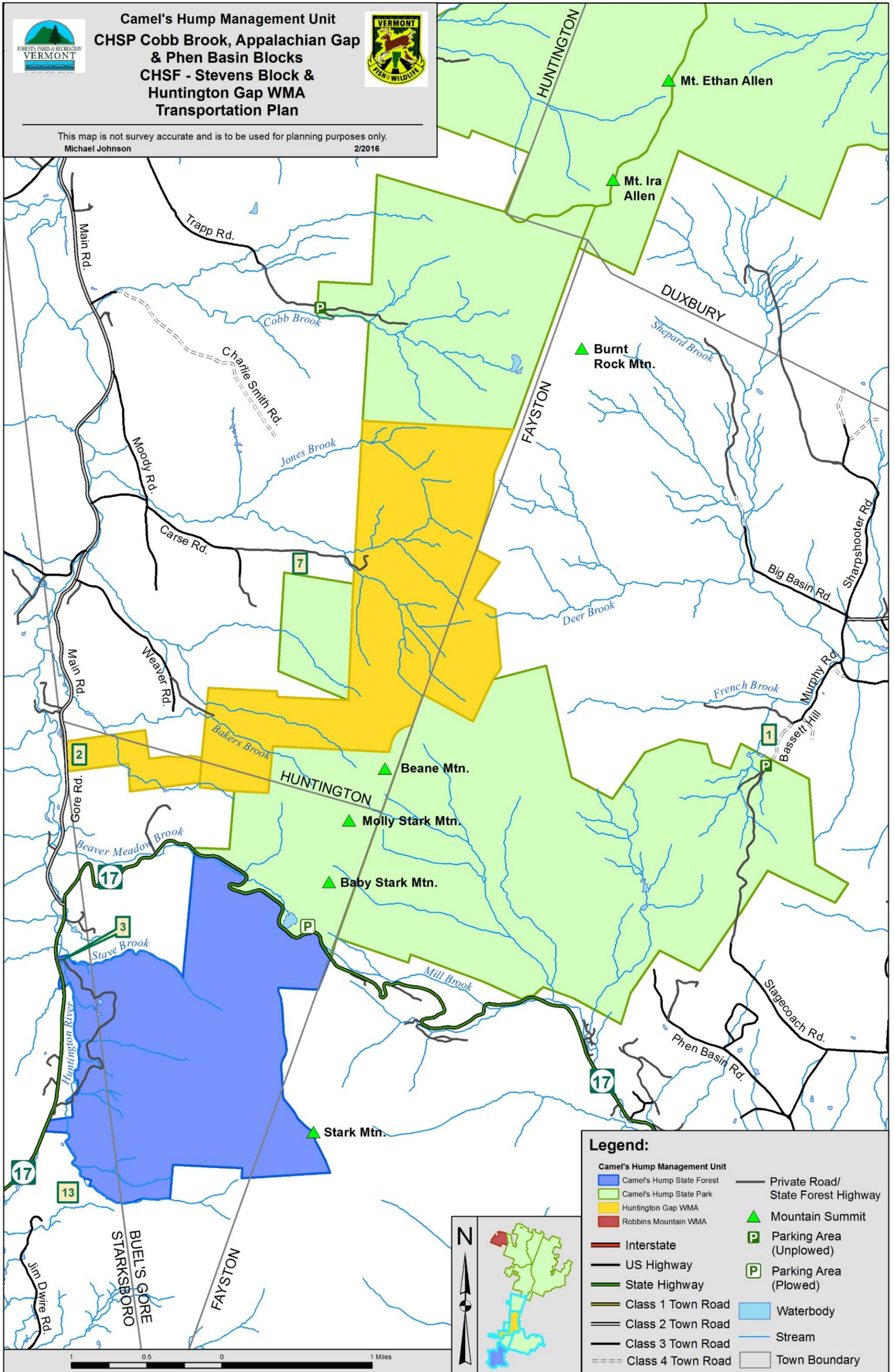


Figure 25- Transportation Plan, Cobb Brook, Appalachian Gap & Phen Basin Blocks Map

### Camel's Hump Management Unit Transportation/Access Needs Plan

#	Location	Classification	Length	Current Uses	Needs	Est. Cost	Target Year
<b>1</b>	745-7	Access road	0.3 mi.	Old road	Upgrade access with Town and landing for harvest #2	\$15,000	2017
<b>2</b>	536-1	Access and landing	0.1 mi.		Establish access and landing for harvest #3	\$8,000	2018
<b>3</b>	004-1	Parking area			Build new parking area	\$8,500	2018
<b>4</b>	745-2	Access road, landing	0.2 mi.	Old farm road	Establish access and landing for harvest #4	\$10,000	2018
<b>5</b>	745-1	Timber access	0.1 mi.	Old access, low use	Re-build truck road, establish landing for harvest #5	\$8,000	2019
<b>6</b>	745-1	Log landings			Establish two new log landings for harvest #8	\$5,000	2020
<b>7</b>	745-6	Access and landing	0.2 mi.		Establish access and landing for harvest #10	\$10,000	2021
<b>8</b>	745-1	Bridge		Old bridge	Replace bridge for VAST Trail and access to harvest #11	\$50,000	2021
<b>9</b>	745-1	Road upgrade	0.5 mi	Truck road, VAST trail	Re-build road, gravel, new culverts for harvest #11	\$30,000	2021
<b>10</b>	745-2	New access road	0.15 mi.		Build new access road and landing for harvest #12	\$10,000	2022
<b>11</b>	745-4	New access road	0.5 mi.		Build new access road and landing for harvest #13	\$30,000	2022
<b>12</b>	745-1	Bridge		Truck road	Build new bridge for access to harvest #15	\$60,000	2023
<b>13</b>	004-1	Access road, landing			Establish access and landing for harvest #23	?	2025
<b>14</b>	745-1	Upgrade road	0.7 mi.	Truck road	Gravel and additional culverts for harvest #24	\$12,000	2027
<b>15</b>	745-1	New access road	0.25 mi.	X-C ski trail	Build new access road and landing for harvest #27	\$15,000	2028

## V. MONITORING AND EVALUATION

During the life of the long-range management plan for the Camel's Hump Management Unit periodic monitoring and evaluation will be conducted to ensure that the resources are protected from fire, insect and disease, encroachments, or unforeseen problems that may occur within the CHMU. Management activities will be evaluated to determine how closely the results matched those projected within the plan. Minor adjustments in management may be made to reflect changed conditions or unanticipated results.

As long-term management for the CHMU continues, inventory, monitoring, assessment, and research are necessary to evaluate the status of the resource, assess progress toward achieving stated goals, and determine the effectiveness of management actions and activities. Obtaining quality information is critical to making informed decisions and conducting sound, thoughtful management actions. Research projects on the CHMU are directed by the district stewardship team to ensure that they do not conflict with the goals and objectives for the CHMU as set forth in the long-range management plan. It is important that individual research projects be assessed for their effects on the resource, potential conflicts with other uses or users, and consist of quality proposals from credible institutions and individuals. All data from research will be shared with ANR.

### **Ecological/Wildlife**

Maintaining the biological diversity of the CHMU requires long-term research and monitoring projects in a number of areas. Some of the efforts at meeting these goals include:

- Continue ongoing inventory and assessment projects including forest inventory, and aerial and ground insect and disease surveys, to better assess and evaluate management of the CHMU.
- Monitor rare, threatened and endangered species and natural communities.
- Consider and support appropriate, credible research project proposals which further the understanding of ecological elements and wildlife habitat on the CHMU and the impacts of management activities.

### **Timber and Wildlife Habitat Management**

An effective monitoring and assessment program is essential for ensuring the long-term sustainability of a quality timber management program. Careful analysis of the forest, its resource capabilities, potential impacts on other important management goals, protection of rare and/or threatened and endangered species, water quality, management or protection of rare and/or state significant natural communities, and the documentation of the occurrence of natural processes (i.e. insect and disease outbreaks, blowdown events) is important in the execution and understanding of the effects of timber management actions. Timber harvests and wildlife management activities completed within the CHMU will be periodically reviewed by the stewardship forester and the district stewardship team to determine how well management objectives are being met. If monitoring results indicate that there is a significant difference between the outcomes predicted by the plan and actual conditions, changes to the plan may be recommended.

- Continue to support ongoing inventory and mapping efforts (e.g. forest inventory, aerial insect and disease surveys).
- Conduct periodic, standardized post-sale inventories to assess effectiveness of management activities.
- Support proposals for appropriate research addressing long-term evaluation of forest management activities.
- Gather baseline data as necessary and practical to support assessment of management effectiveness and impacts.

### **Infrastructure**

Infrastructure monitoring has been an ongoing process and largely informal. Advances in field data collection methods and data management should make this easier and more effective moving forward. There are many miles of roads, and numerous culverts and bridges, in variable conditions that need to be documented in order to effectively maintain, repair, and replace infrastructure to ensure adequate access by users and improve water quality. Proper documentation of infrastructure and its condition can help ANR make a stronger case for increased funding to address legacy issues.

- Working with other districts and ANR IT, standardize data collection and long term data storage in relation to roads, gates, culverts, bridges, etc.

### **Recreation**

Public recreation will be periodically monitored across the property by the district stewardship team to identify recreation trends, changing public demands, infrastructure improvement needs, user conflicts, and areas where recreation may be damaging natural resources. Changes in recreational uses may be implemented including new management strategies designed to minimize or eliminate conflicts. Game wardens will be asked to assist with maintaining compliance with state laws. In order to appropriately monitor recreation, the state will need to:

- Establish standardized inventory and documentation of any illegal use and damage of resources.
- Support appropriate research projects including the collection of baseline data to expand knowledge of recreational carrying capacity; resource impacts; and user conflicts.

### **Historic**

There are both historic and pre-contact resources within the CHMU. Current understanding and documentation of these resources varies by site. Detailed documentation and study of field evidence is an important component to the understanding, protection, and interpretation of the individual sites and the greater historic context of the CHMU and surrounding areas. To further the conservation of historic resources, ANR will:

- Continue to inventory, map, and document historic features.
- Monitor and document condition of known historic features using standardized forms and photo documentation.
- Support efforts to research the history of the CHMU.

### **Invasive Exotic Species**

Invasive exotic plant species are known to be a problem in many areas of the state, negatively impacting wildlife habitat, timber management, natural community composition, recreation, and economics. The district stewardship team will monitor the CHMU for the presence of invasive exotic species and work with cooperating partner organizations to develop a monitoring protocol. The district stewardship team will work to identify populations of invasive exotic species and implement control measures where feasible. Monitoring strategies include:

- Identify invasive species when populations are small. Set control goals.
- Assess and document levels of introduction of invasive exotic pests.
- Monitor timber sale areas before and after timber sale activities.
- Control invasive species as necessary and practical.
- Evaluate invasive species control projects for effectiveness.

### **Climate Change**

If the most conservative current models of climate change are accurate (Iverson, Prasad, Hale, & Sutherland), the CHMU, like the rest of the region, will experience strong impacts over the next 50-100 years. These changes may have important consequences for forest nutrient cycling, timber productivity, forest pest ecology, wildlife habitat, and our enjoyment of the forest.

- Continue ongoing projects promoting the collection and documentation of long-term information critical to the assessment and evaluation of management on the CHMU.
- Support appropriate research project proposals which further understanding of climate change on the CHMU.

## VI. NEW USES AND PLAN AMENDMENT PROCESS

The long-range management plan provides guidance for the long-term management and development of a parcel of state land. However, the future cannot be fully determined at the time of plan development. The departments of Fish and Wildlife and Forests, Parks and Recreation undertake an amendment or plan update process when significant changes to the current long-range management plan are proposed. These may include:

- 1) Substantial changes to any goals, management objectives, and implementation actions contained in the current plan;
- 2) Major change in land use, land classification, or species management direction;
- 3) Permanent closure of existing trails and/or permanent creation of new recreation corridors not identified in the current plan;
- 4) Major rerouting, reclassification, permanent closing or creation of new roads within state land boundaries not identified in current plan;
- 5) Major land acquisitions added to the existing parcel;
- 6) Major capital expenditures for new projects;
- 7) Facility closures;
- 8) Transfers in fee ownership;
- 9) Leasing of new acreage; and
- 10) Renaming of natural features (prior to recommendation to Department of Libraries) or lands.

When the amendment process is triggered, a public involvement process begins. The type of process is determined at the time and is dependent upon the extent and type of amendment. If applicable, the easement holders are notified to discuss the proposed amendment.

There may be times when public input and comments are sought regarding plan changes that are less significant than those triggering the plan amendment process. This is left to the discretion of the district stewardship team.

## VII. FUTURE ACQUISITIONS/DISPOSITIONS

Through its October 1999 *Vermont Agency of Natural Resources Lands Conservation Plan*, the Agency outlined priorities for acquiring new lands as well as for acquiring additions to existing ANR lands. It is the State's policy to acquire additions to ANR State lands parcels that are:

- 1) Necessary for maintaining or enhancing the integrity of existing state holdings;
- 2) Lands, such as in-holdings and other parcels that serve to consolidate or connect existing State holdings and contain important public values and/or facilitate more efficient ANR land management;
- 3) Parcels that enhance or facilitate public access to ANR lands; and
- 4) Parcels that serve an identified facility, infrastructure, or program need.

All new acquisitions of land to the CHMU will be guided by this plan and must have a willing seller, as the agency does not have the authority to exercise eminent domain. They will also be done in consultation with the regional planning commission(s) and the town(s) in which the parcel is located.

Any future disposition of land from the CHMU will be approved by ANR Agency Land Acquisition Committee (ALAC) and the Secretary of ANR after consultation with the regional planning commission(s) and the town(s) in which the parcel is located.

In 2016, the Trust For Public Land, with the help of ANR acquired the 2085 acre Dowsville Headwaters Property using federal funds through the Forest Legacy Program. This property, commonly referred to as "Dowsville" was then conveyed to the Department of Forests, Parks and Recreation for inclusion as part of Camel's Hump State Park. The parcel is adjacent to CHSP and visited by hikers, skiers, and mountain bikers. Because of this active use, FPR completed an Interim Stewardship Plan (see Appendix N) for the property that identified current recreation uses that will be allowed to continue, and those activities that would need to wait until a comprehensive amendment was created. In time, a full amendment/addendum will be made to the CHMU LRMP utilizing the proper assessments

All future acquisitions to the CHMU will require an amendment to this comprehensive Long Range Management Plan prior to active management of the newly acquired parcel.

## VIII. APPENDICES

- A. [Land Transactions History](#)
- B. [Legal Constraints Matrices](#)
- C. [Cultural Landscape Report](#)
- D. [Archeological Sensitivity Study](#)
- E. [Public Involvement Input and Responsiveness Summaries](#)
- F. [Natural Communities Information](#)
- G. [Recreation Use Data](#)
- H. [Forest Stand Data and Maps](#)
- I. [Assessment of the Native Bee Diversity of CHMU](#)
- J. [Photo Gallery](#)
- K. [Information Sources](#)
- L. [Literature Utilized in Formulating the CHMU LRMP](#)
- M. [Public Use of VT F&W Lands](#)
- N. [Glossary](#)